NIC - 310
Digital Oscilloscope
Service Manual

Nicolet
INSTRUMENTS OF DISCOVERY
Nicolet Instrument Corporation

Test Instruments Division
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INTRODUCTION

WARNING: The service instructions in this manual are for qualified personnel only. High voltages exist within this instrument. Follow the safety standards set forth by your place of employment.

Read the CAUTION NOTES in section 4 of this manual and then read the entire procedure(s) before servicing the instrument. If any questions arise, contact:

Nicolet Instrument Corporation
Test Instruments Division, Service Department
5225 Verona Road
Madison, Wisconsin 53711
Telephone 608/271-5010

CAUTION: Read the Power Requirements, section 5 of this manual before applying power to the instrument.

IMPORTANT: Erroneous time and voltage values will be decoded by the numerics if the Time Per Point or Volts Full Scale settings are changed during a slow sweep.

In addition, data stored in the display memory will be lost if any of the following occurs -

1. The LIVE button is pressed and a valid trigger initiates a sweep.
2. Data is read from the disk drive accessory into an active channel.
3. Power is removed from the instrument.

RECEIVING

Unpack the instrument and save the carton and packing material in case the instrument must be shipped to another site or returned to the factory for service.

INSPECTION

Inspect the exterior of the instrument for any visible signs of damage that may have occurred during transit.

If damaged, call for instructions at:

Nicolet Instrument Corporation
Test Instruments Division, Shipping Department
5225 Verona Road
Madison, Wisconsin 53711
Telephone 608/271-3333

Outside the U.S., call your local Nicolet office or distributor.

CAUTIONS

The following WARNING note is required by the FCC and relates only to the interference potential of this equipment. This message is a direct quotation. Although stated as a "WARNING", there is essentially no risk of injury, loss of life, or equipment damage.

WARNING: The equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J or Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures be required to correct the interference.

CAUTION: This instrument and related accessories are not designed for biomedical experiments on humans and should not be directly connected to human subject.

CAUTION: This instrument must not be operated in explosive atmospheres.

WARNING: High voltages exist within this instrument. Use care while performing the alignment procedures.

CAUTION: Ensure that the input signal does not exceed the maximum allowable input voltage, with respect to ground, listed in the specifications located in the rear cover pocket of this manual.

WARNING: Refer to section 5 (Power Requirements) before applying power to the instrument.

CAUTION: Remove all power from the instrument before removing its covers.

POWER REQUIREMENTS

This Nicolet Digital Oscilloscope is designed to operate from either of the following two single phase power source voltages:

90 to 130 vac, (47 to 440 Hz), or
180 to 260 vac, (47 to 440 Hz).

The power requirement of the instrument is nominally 85 watts.

The power source must include all three of following:

#1. A neutral wire at or near ground potential.

#2. A separate safety ground at ground potential.

#3. A line (hot) wire.

Figure 1 illustrates the locations of the neutral, line, and earth ground terminals located on the male power connector at the rear of the instrument.

WARNING: Inspect the voltage selection switch, Figure 2, located at the rear of this instrument, for the correct setting BEFORE applying power.

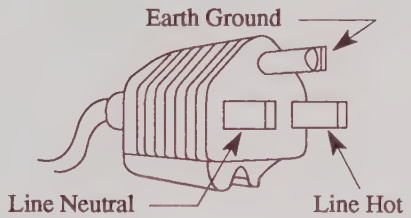

Figure 1

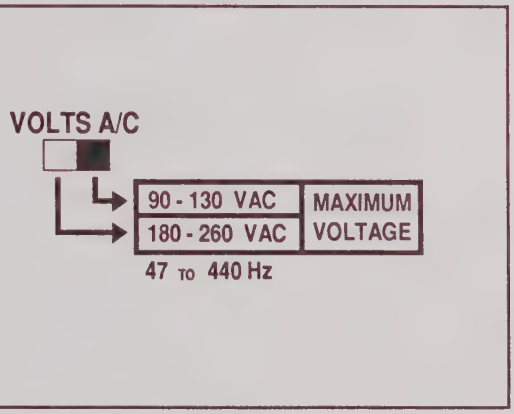

Figure 2

310 ASSEMBLY IDENTIFICATION

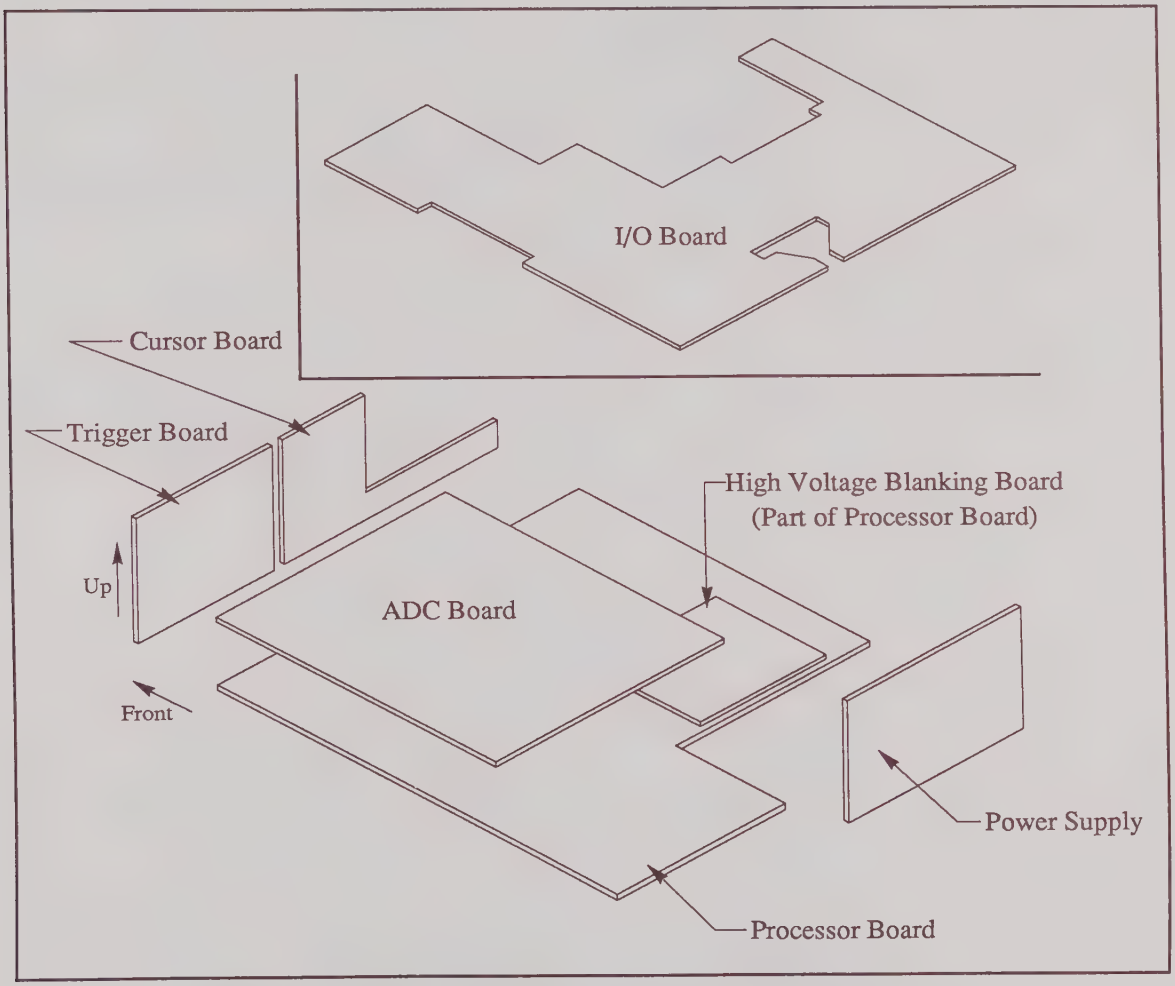

Figure 6-1: Assembly Identification including ADC without MOD Board.

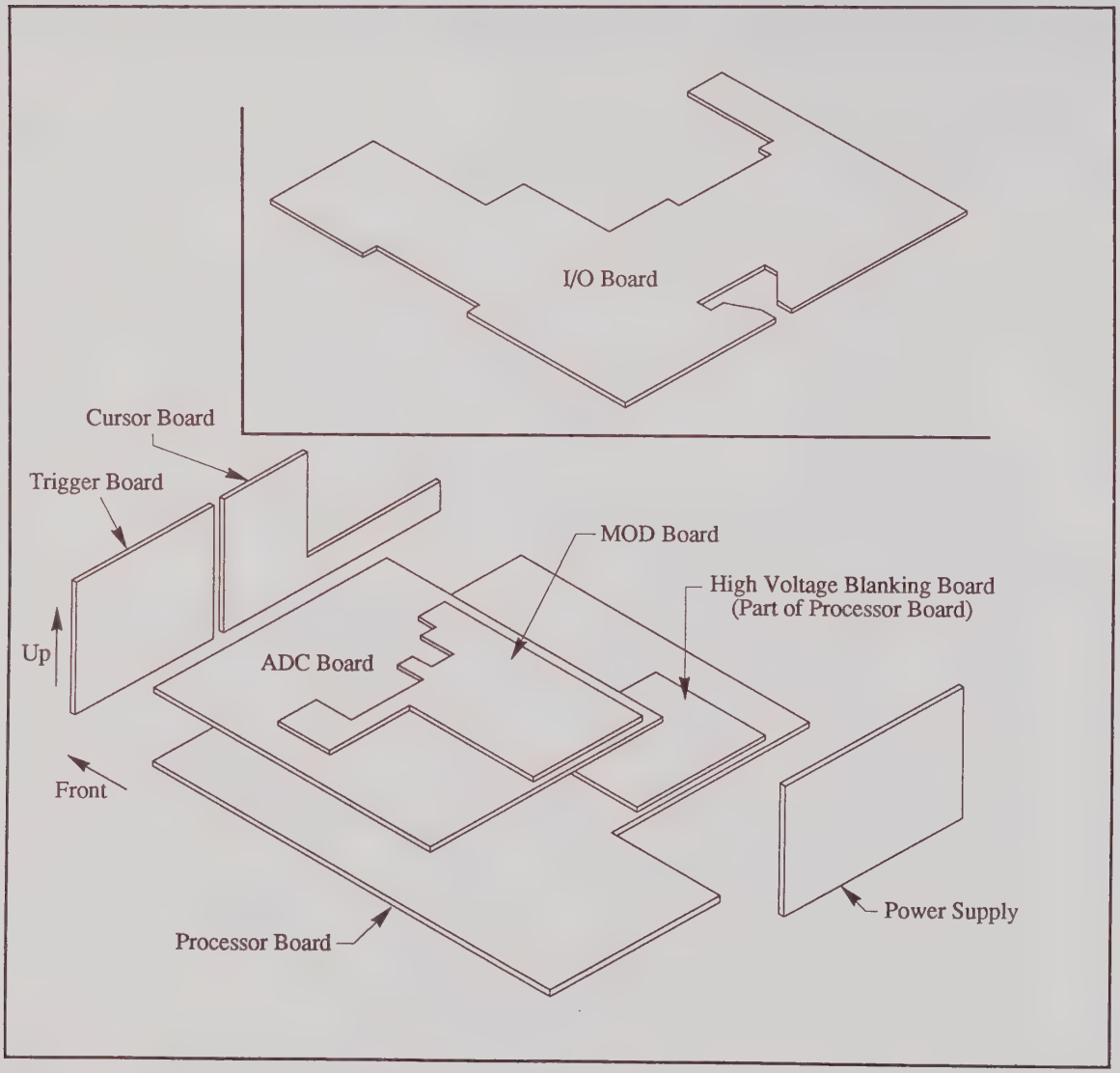

Figure 6-2: Assembly Identification including ADC with MOD Board.

DISASSEMBLY PROCEDURES

This section describes the procedures required to disassemble the 310.

Refer to the Dissassembly index to locate the required procedure.

IMPORTANT: Review the Caution Notes (Section 4) and then read the applicable procedure in its entirety before servicing this instrument.

If any questions arise, contact:

Nicolet Instrument Corporation
Test Instruments Division, Service Department
Madison, Wisconsin 53711
Telephone: 608/273-5010

DISASSEMBLY PROCEDURE	PAGE
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Front Panel Assembly	7-4
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ADC Board	7-10
Trigger Board	7-12
Cursor Board	7-14
CRT Display	7-15
Rear Panel Assembly	7-16

REMOVING THE ADVANCED I/O PENTHOUSE AND/OR TOP COVER

This procedure removes the penthouse positioned on the top cover in Advanced I/O equipped models or removes the top cover if no penthouse is present.

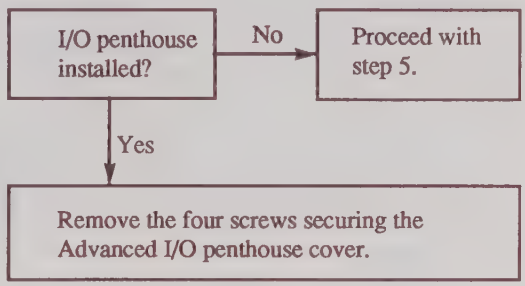
IMPORTANT: Review the Caution Notes in Section 4 of this manual before proceeding.

Tools Required

1. Philips screwdriver (#1).

Procedure

1. Position the carrying handle over the front panel as the instrument rests on its bottom with the rear panel facing you.

2. 

3. Tip the cover toward the back. Remove the LED display ribbon cable from terminal A at the front corner of the I/O board (Figure 1). Set the penthouse cover aside.

4. Disconnect the processor-to-I/O ribbon cables from connectors B, C and D and the power cable from connector E. Push the terminators through openings in top cover, (Figure 1).

5. Remove the six screws securing the top cover and set the cover and Advanced I/O penthouse (if installed) aside.

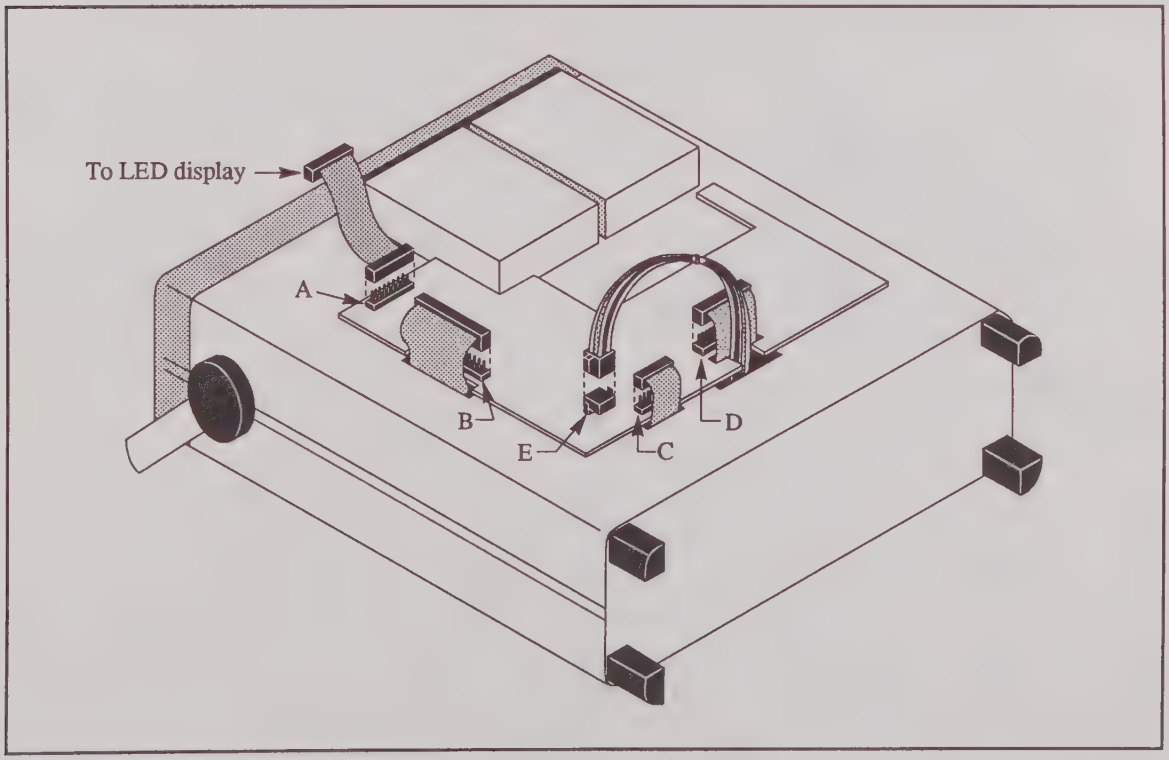


Figure 1

REMOVING THE FRONT PANEL ASSEMBLY

This procedure removes the Front Panel Assembly consisting of the Cursor, Trigger and ADC boards.

IMPORTANT: Review the Caution Notes in Section 4 of this manual before proceeding.

Tools Required

1. Philips screwdriver.

Procedure

1. Perform the Advanced I/O Penthouse and/or Top Cover Removal procedure, (page 7-3).
2. Position the carrying handle over the front panel and tip the instrument to rest on its top.
3. Remove the six screws securing the bottom cover and set the cover aside.
4. Tip the instrument to rest on its bottom with the rear panel facing you.
5. Disconnect the Power Supply-to-ADC power cable from connector A (Figure 1).
6. Disconnect the Processor-to-ADC ribbon cable from the connector B (Figure 1).

> **CAUTION:** Recover any screw or washer dropped during the next step before continuing.

7. Remove the ADC securing screw from point C (Figure 1).

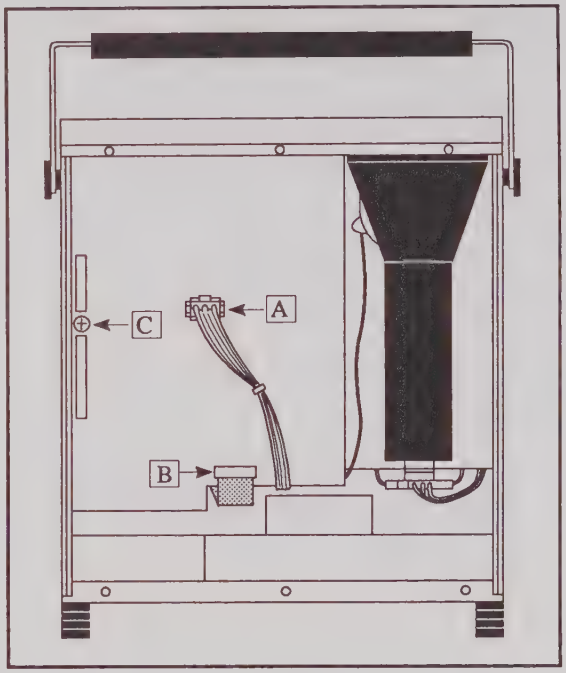


Figure 1

8. Carefully tip the instrument over to rest on its top with the rear panel facing you.

9. Disconnect the ADC-to-Processor ribbon cables from connectors A and B (Figure 2).

10. Disconnect the Cursor-to-Processor ribbon cables from connector C (Figure 2).

11. Remove the four Processor securing screw and washer sets from points D1-D4 and from point E (Figure 2).

CAUTION: Wires are attached to the Processor board. Use care while performing the next step.

12. Carefully tilt the front of the Processor board away from the instrument and tuck the ribbon cable (disconnected in step 10) under the Processor board (Figure 3).

13. Carefully stand the unit upright on its rear panel feet.

CAUTION: Do not bind or pinch any of the ribbon cables or wiring bundles during step 14.

14. Carefully pull the Front Panel from the front of the oscilloscope and set it aside on a clean surface.

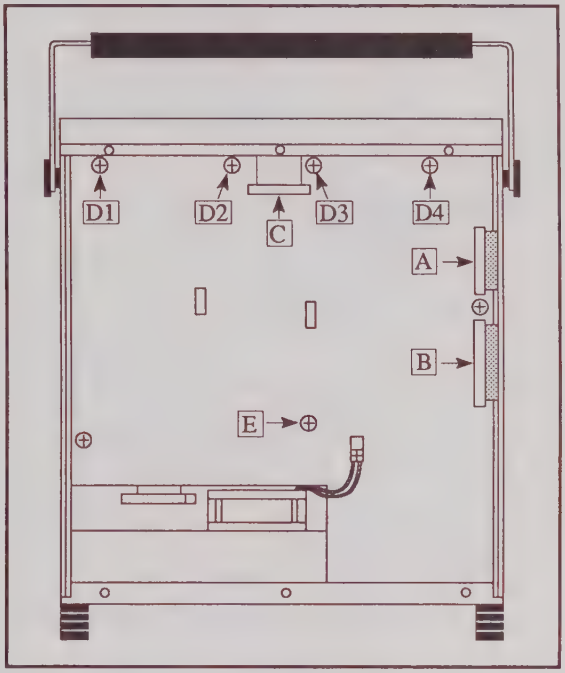


Figure 2

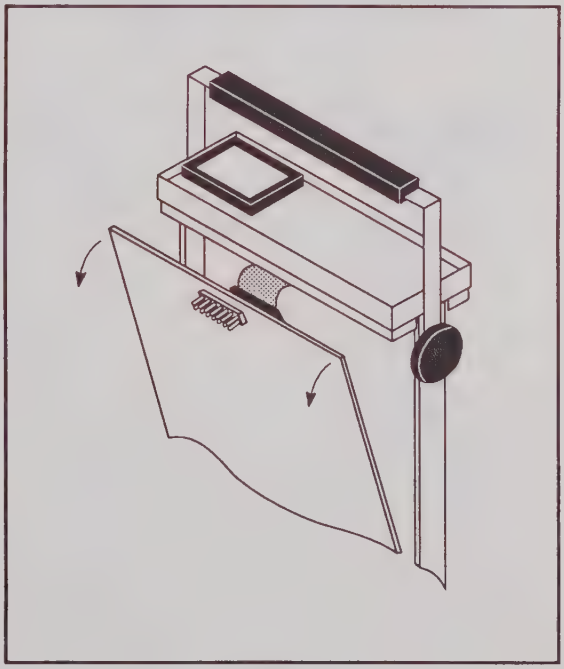


Figure 3

REMOVING THE PROCESSOR BOARD

This procedure removes the Processor board.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips Screwdriver, (#1).
2. Hex Wrench, (0.050").

Procedure

1. Perform the Front Panel Removal procedure, (page 7-4).
2. Disconnect the Processor-to-Fan power cable from connector A, (Figure 1).
3. Position the carrying handle over the Front Panel.

> **CAUTION:** The processor board will not be secured after Step 4. Support the Processor board through Step 5.

4. Remove the Processor board securing screw from point B, (Figure 1).
5. Carefully lay the instrument down to rest on its bottom with the rear panel facing you.

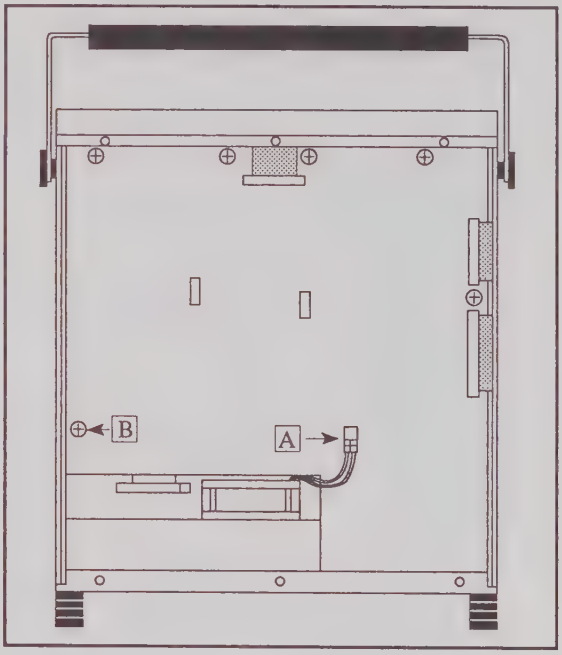


Figure 1

6. Remove the two RS-232/Pen Output connector securing screws (A & B) from the rear of the instrument, (Figure 2).

7. Remove the Pen Speed control knob (C) and the plastic insulator (D) from the rear of the instrument, (Figure 2).

8. Disconnect the CRT cable from point A, (Figure 3).

9. After removing the protective plastic boot from within the CRT shield to expose the terminal, disconnect the High Voltage Anode wire from the CRT at point B by compressing the terminal (Figure 3). Free the wire from the wire holders attached to the CRT shield.

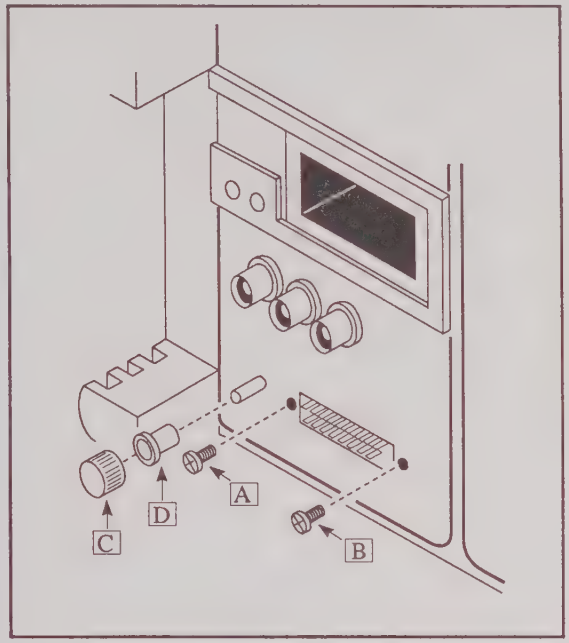


Figure 2

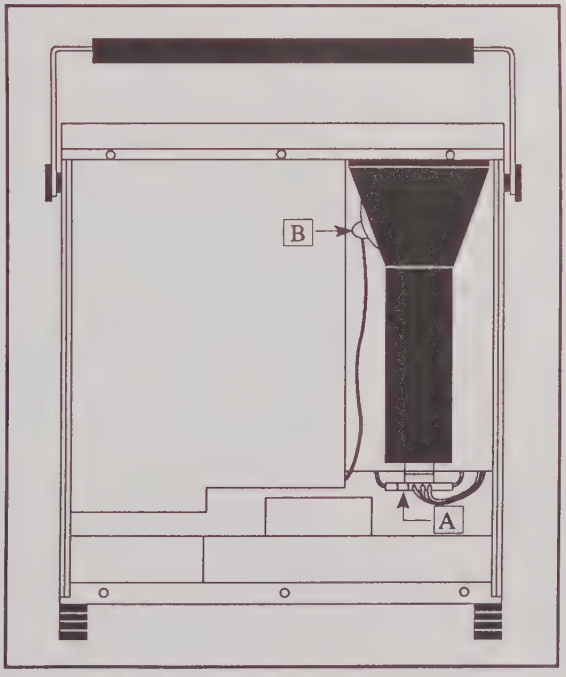


Figure 3

10. Disconnect the Power Supply-to-Processor cable from connector A, (Figure 4).

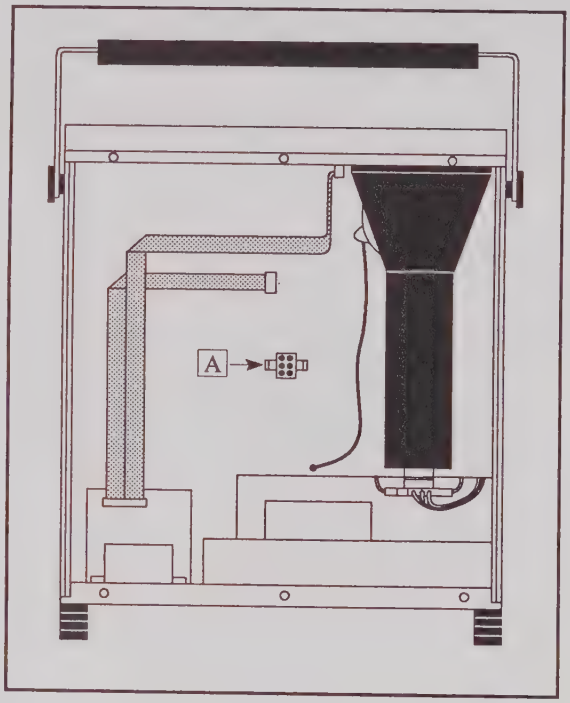


Figure 4

CAUTION: A ribbon cable is still connected to the Processor board. Use care during Step 11.

11. Carefully slide the processor board away from the rear panel until the Pen Speed control and RS232/Pen Output connector clear the rear panel.

12. Carefully tilt the instrument upright until it is standing on its rear panel feet, (Figure 6).

13. Disconnect the Pen BNC-to-Processor ribbon cable from connector on bottom side of board, (Figure 7).

14. Set the Processor board aside on a clean surface.

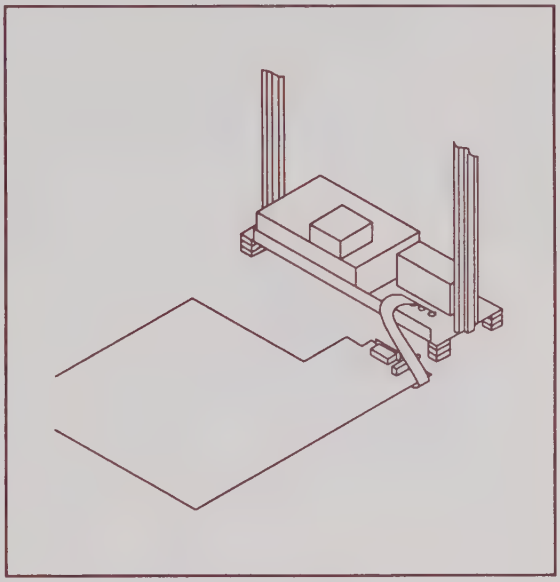


Figure 6

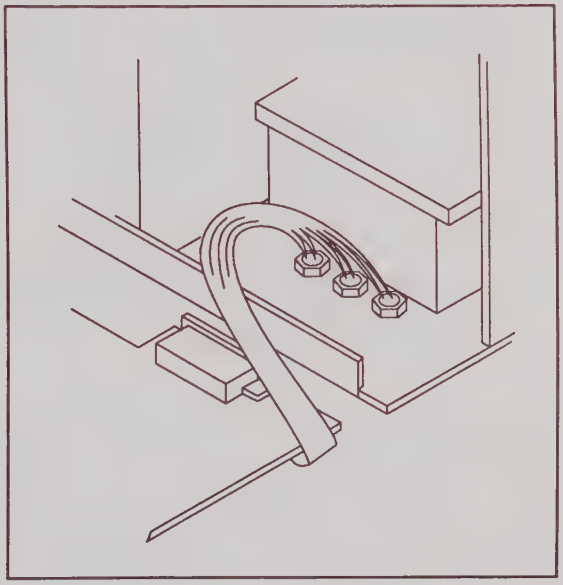


Figure 7

REMOVING THE ADC BOARD

This procedure removes the ADC board.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Philips screwdriver, (#1).
2. Common screwdriver, (3/16").
3. Hex Wrench,(3/64")
4. Hex Wrench,(1/16")
5. Hex Wrench,(5/64")
6. Hex Wrench,(1.5mm)
7. Wrench, (1/2")
8. Wrench, (5/16")

Procedure

1. Perform the Front Panel Removal Procedure, (page 7-4).

2. Lay the Front Panel assembly on the workbench in the upright position.

3. Disconnect the Live/Hold LEDs-to-ADC board ribbon cable from connector A, (Figure 1).

4. Turn the Front Panel Assembly over to rest upside down.

5. Disconnect the Cursor-to-ADC ribbon cable from connector A, (Figure 2).

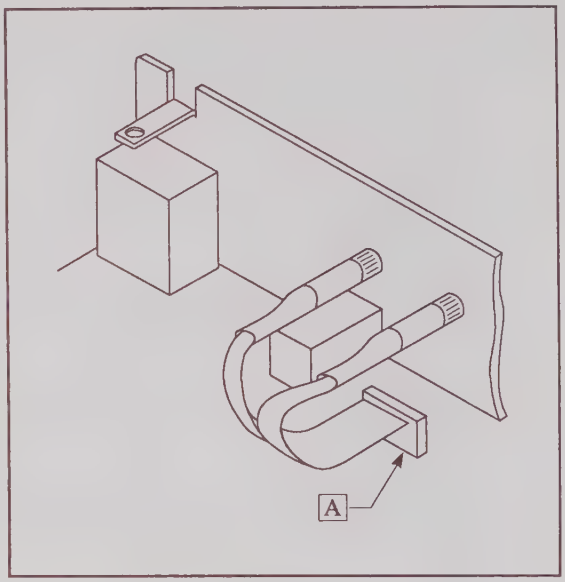


Figure 1

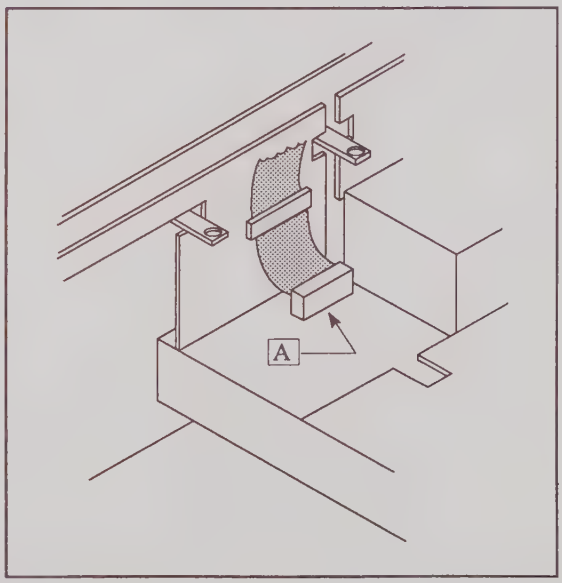


Figure 2

6. Disconnect the Trigger-to-ADC ribbon cable from connector A, (Figure 3).

> **CAUTION:** Wires at the ends of each coaxial cable are plugged into the ADC board. Use care not to bend or break these during the remainder of this procedure.

7. Disconnect the Trigger-to-ADC coaxial cables from the ADC board connectors A1 through A4 by carefully pulling on the cables, (Figure 4).

8. Carefully pull off the channel A and B Mode knobs.

9. With a hex wrench, remove the DC Offset, Volts Full Scale, Time Per Point, and Expansion knobs.

10. Remove the securing nuts from the DC Offset, Volts Full Scale, Time Per Point, and Expansion switches.

11. Carefully pull the ADC board from the Front Panel.

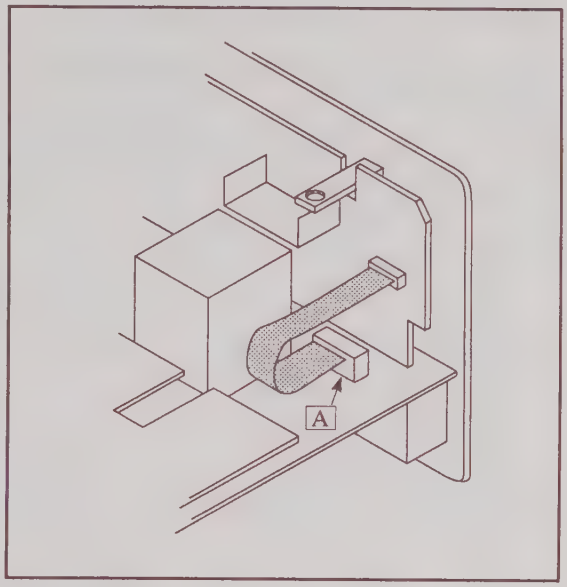


Figure 3

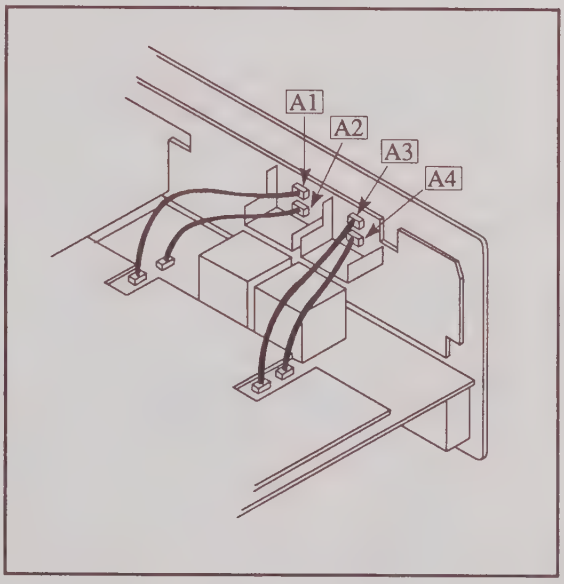


Figure 4

REMOVING THE TRIGGER BOARD

This procedure removes the Trigger board from the Front Panel Assembly.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Soldering Iron.
2. Phillips screwdriver, (#1).
3. Common screwdriver, (3/16")
4. Hex Wrench, (3/64")
5. Hex Wrench, (1/16")
6. Hex Wrench, (5/64")
7. Hex Wrench, (1.5 mm)
8. Wrench, (1/2")
9. Wrench, (5/16")

Procedure

1. Perform the ADC Board Removal procedure, (page 7-10).

2. Carefully pull off the (+/-) Slope, DC/AC, Pre-Trigger and A/B/EXT trigger knobs, and the four DC/AC/GND input BNC knobs.

3. Remove the trigger Level knob with a hex wrench and the securing nut with a 5/16" wrench.

4. Lay the Front Panel Assembly face down on the work bench.

5. Carefully unsolder the Auto/Norm LED ribbon cable from the Trigger board, (Figure 1).

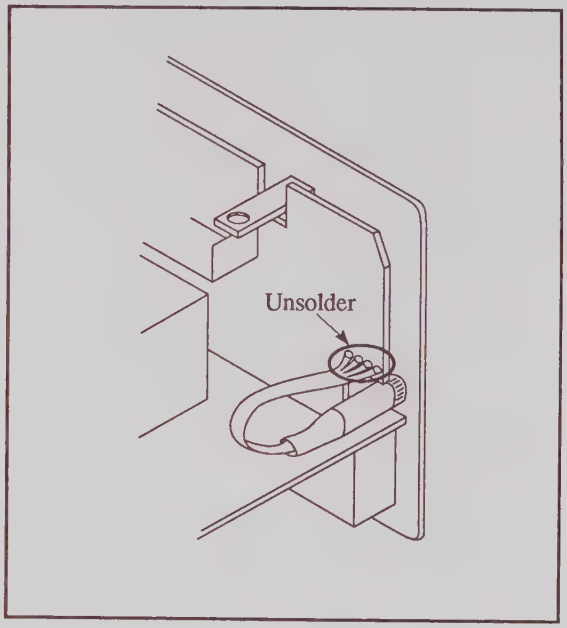


Figure 1

CAUTION: Wires (at the ends of each coaxial cable) are plugged into the Trigger board. Use care not to bend or break these during the next step.

6. Disconnect the Trigger-to-ADC coaxial cables from the Trigger board connectors A1 through A4 by carefully pulling on the cables, (Figure 2).

7. Unsolder the five BNC connectors from the Trigger board, (Figure 3).

8. Remove the Trigger board securing screw from the top of the board at point A, (Figure 3).

9. Remove the board and set aside on a clean surface.

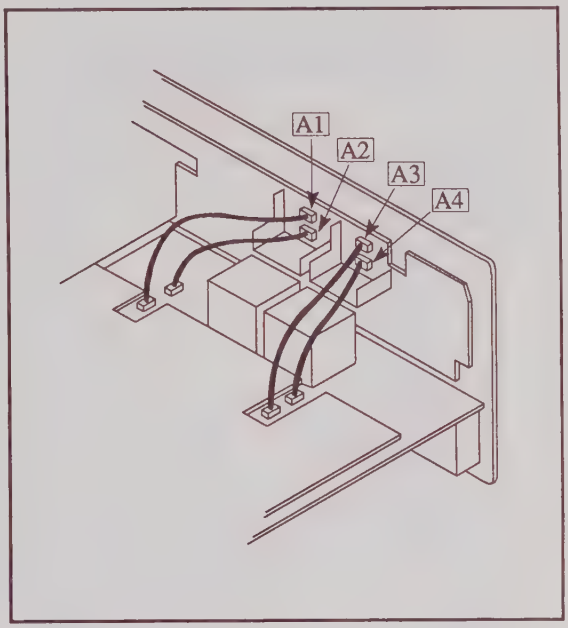


Figure 2

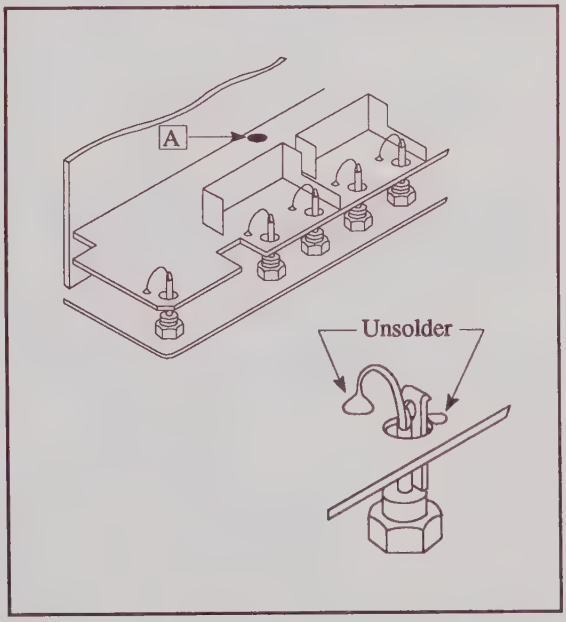


Figure 3

REMOVING THE CURSOR BOARD

This procedure removes the Cursor board.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips screwdriver, (#1).
2. Hex wrench, (1.5 mm).

Procedure

1. Perform the Front Panel Assembly removal procedure, (page 7-4).

2. Disconnect the Cursor-to-ADC board ribbon cable from connector A, (Figure 1).

3. Carefully pull off the Autocenter and Display switch knobs.

> **CAUTION:** Recover any screws or washers dropped during the next step before continuing.

4. Remove the five screw and washer sets from the Cursor board.

> **CAUTION:** Perform Step 5 with care to guard against damaging the buttons or printed circuit board.

5. Carefully remove the board from the front panel and set it aside on a clean surface.

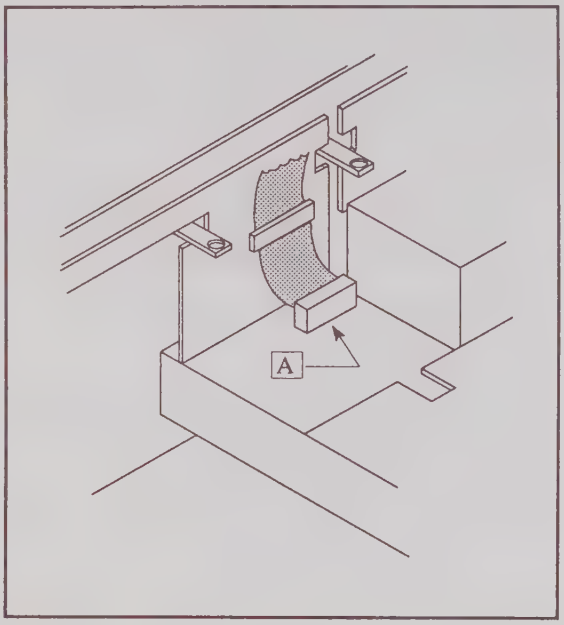


Figure 1

REMOVING THE CRT DISPLAY

This procedure removes the CRT.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips screwdriver, (#1).
2. Common screwdriver, (3/16").

Procedure

1. Perform the Front Panel Removal procedure, (page 7-4).
2. Carefully lay the 310 down to rest on its bottom with the rear panel facing you.
3. Disconnect the CRT cable from the CRT at point A, (Figure1).
4. After removing the protective plastic boot from within the CRT shield to expose the terminal, disconnect the High Voltage Anode wire from the CRT at point B by compressing the terminal (Figure 1). Free the wire from the wire holders attached to the CRT.
5. Rotate the 310 around until the front panel is facing you.
6. Remove the two CRT securing screws from the 310 at points A and B, (Figure 2).
7. Carefully turn the 310 over to rest on its top with the front panel facing your left.
8. Raise the carrying handle away from the front of the instrument.

WARNING: Handle the CRT with care.

9. Carefully slide the CRT out of the CRT holder and set aside on a clean surface.

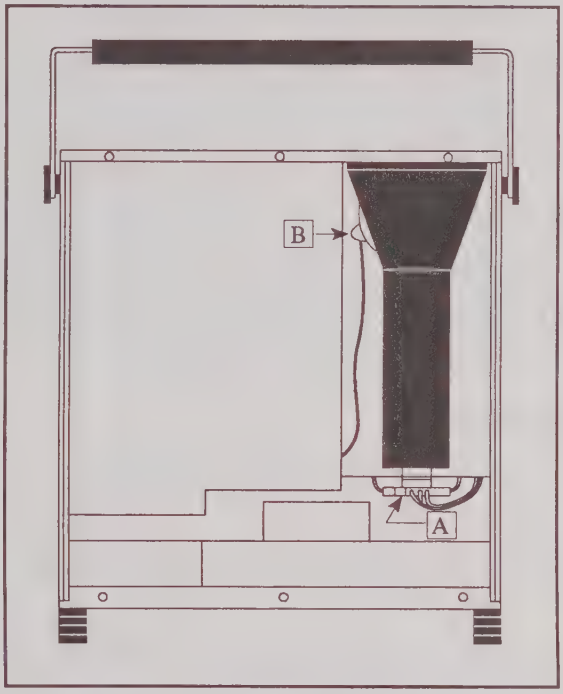


Figure 1

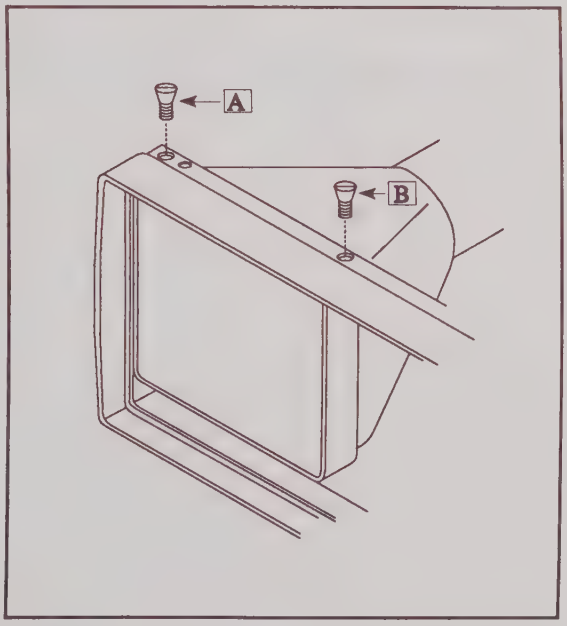


Figure 2

REMOVING THE REAR PANEL ASSEMBLY

This procedure removes the Rear Panel Assembly.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips screwdriver, (#1).
2. Phillips screwdriver, (#2).
3. Common screwdriver, (3/16").
4. Hex wrench, (0.050").

Procedure

1. Perform the Front Panel Removal procedure, (page 7-4).

2. Perform the Processor Board Removal procedure, (page 7-6).

3. Carefully lay the 310 down on the workbench with the rear panel facing you.

4. Remove the rear panel securing screws and washer sets, (Figure 1).

5. Slowly pull the rear panel from the frame and set it aside on a clean surface.

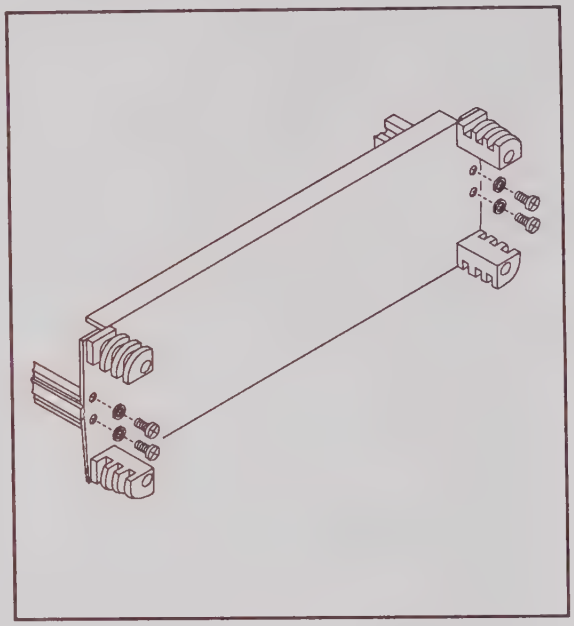


Figure 1

REASSEMBLY PROCEDURES

This section describes the procedures required to reassemble the 310.

Refer to the Reassembly Index to locate the required procedure.

IMPORTANT: Review the Caution Notes (Section 4) and then read the applicable procedure before servicing this instrument.

If any questions arise, contact:

Nicolet Instrument Corporation
Test Instruments Division, Service Department
Madison, Wisconsin 53711
Telephone 608/273-5010

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Rear Panel Assembly	8-17
I/O Penthouse and/or Top Cover	8-18

REINSTALLING THE FRONT PANEL ASSEMBLY

Perform the Processor Board Reassembly procedure first, page 8-6.

This procedure reinstalls the Front Panel Assembly consisting of the Cursor, Trigger, and ADC boards.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tool Required

1. Phillips screwdriver, (#1).

Procedure

1. Carefully stand the scope on its rear panel, (front panel facing up).
2. Position the 310's carrying handle over the Processor board.

CAUTION: Do not bind or pinch any of the ribbon cables or wiring bundles during Step 3.

3. Carefully slide the Front Panel assembly into the front of the oscilloscope.
4. Position the 310's carrying handle over the front panel.
5. Lay the 310 down on its top with the rear panel facing you.

CAUTION: Wires are attached to the processor board. Perform Step 6 with care.

6. Tilt the front of the Processor board away from the the 310 and pull the Cursor-to-Processor ribbon cable over the Processor board, (Figure 1).

7. Reconnect the Cursor-to-Processor ribbon cable to connector A (Figure 2).

8. Reconnect the ADC-to-Processor ribbon cable to connector B (Figure 2).

CAUTION: Recover any screws or washers dropped during the next step before continuing.

9. Replace four Processor securing screws and washer sets at points D1-D4, and at points E and F if previously removed, (Figure 2).

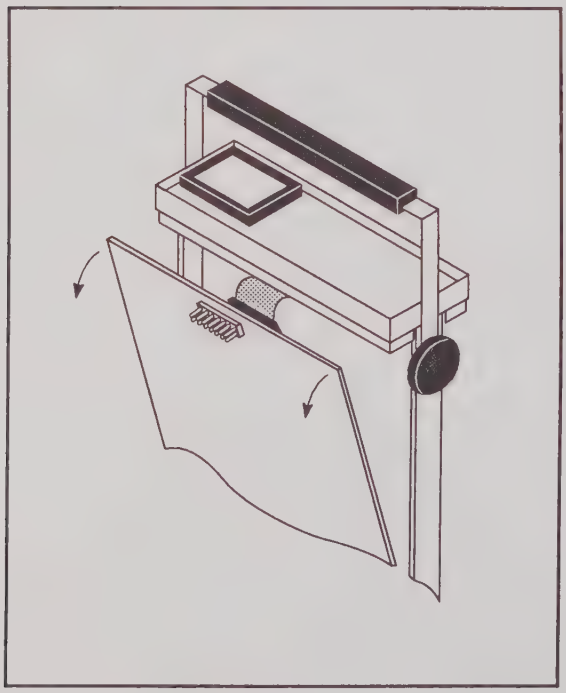


Figure 1

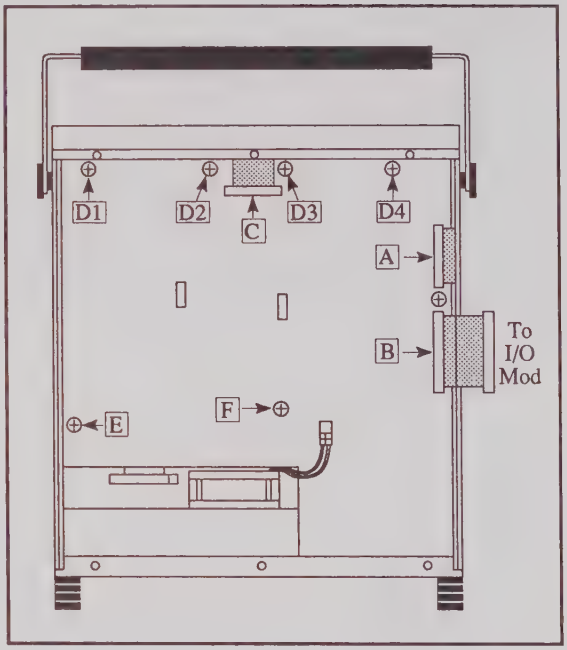


Figure 2

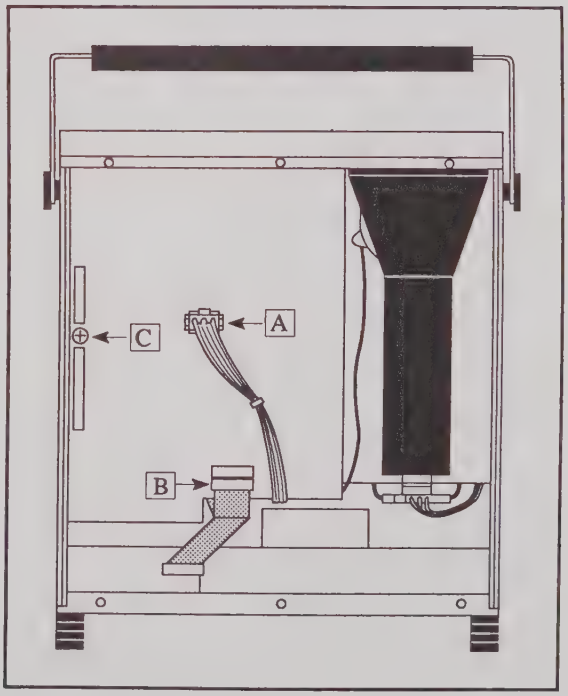


Figure 3

10. Replace the bottom cover and secure with six securing screws.

11. Carefully turn the scope over to rest on its bottom with the rear panel facing you.

12. Reconnect the shorter of the 2 (or the only, with no I/O penthouse) Power Supply-to-ADC power cable(s) to connector B, (Figure 3).

13. Reconnect the Processor-to-ADC ribbon cable to connector A (Figure 3).

CAUTION: Visually inspect the interior of the 310 for any foreign material (e.g., tools, solder splashes, etc.) and any loose wires before continuing.

14. To replace the Advanced I/O Module or top cover perform the procedure on page 8-18.

REINSTALLING THE PROCESSOR BOARD

This procedure reinstalls the Processor board.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips screwdriver, (#1).
2. Hex wrench, (0.050").

Procedure

1. Stand the 310 on its rear panel and position the Processor board on the workbench as illustrated in Figure 1.

2. Position the carrying handle over the front of scope.

3. Reconnect the Pen to-BNC-Processor ribbon cable to connector by running the cable around to the component side of board. (Figure 2).

4. Carefully remount the Processor board while guiding the Pen Speed control and RS-232C/Pen Output connector into the rear panel openings.

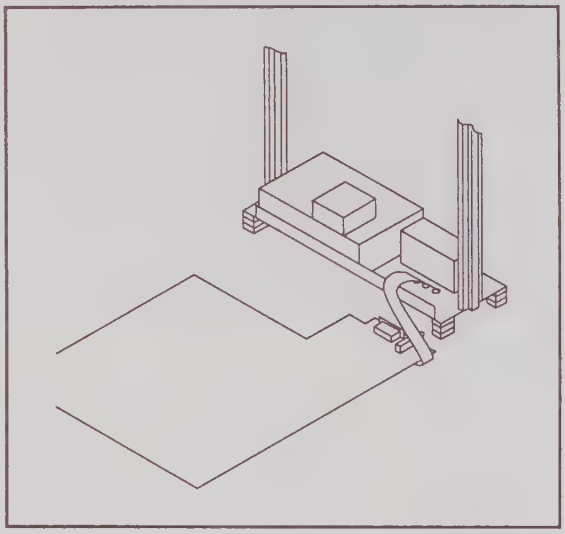


Figure 1

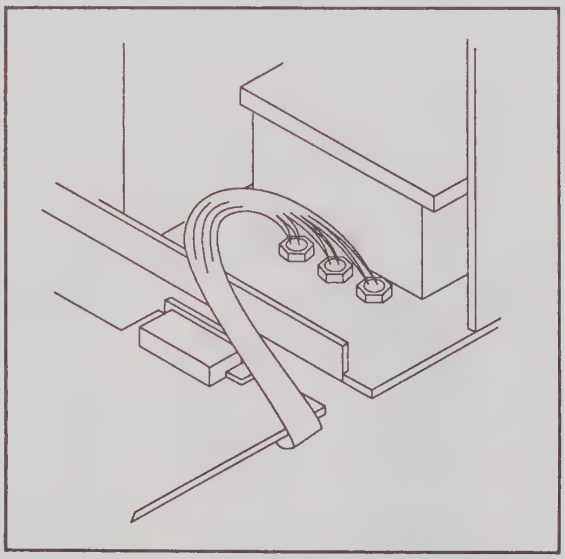


Figure 2

5. Carefully lower the 310 onto the workbench with the processor board positioned up and the rear panel facing you.

6. Secure the Processor board with a securing screw and washer at point A, (Figure 3).

7. Reconnect the Fan-to-Processor power cable to connector B, (Figure 3).

8. While supporting the Processor board, turn the 310 over to rest on its bottom with the Processor board toward the workbench and the rear panel facing you.

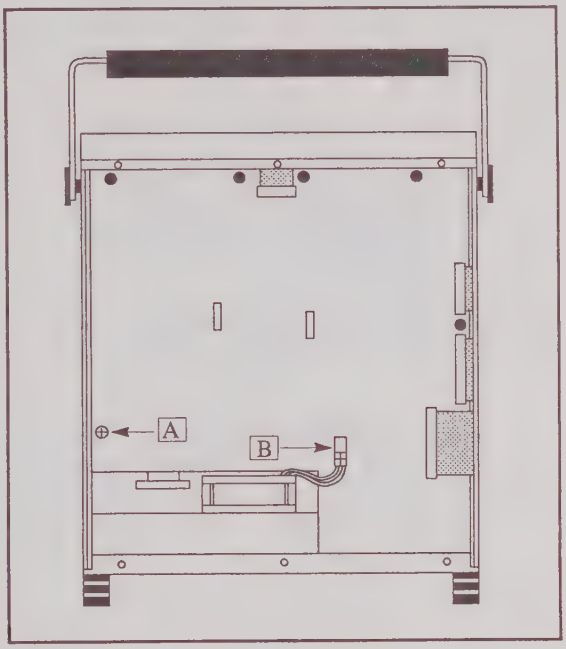


Figure 3

9.

I/O penthouse to be reinstalled? — No → Proceed With Step 10.

Yes ↓

Connect the shortest of the three Power Supply cables to the Processor board connector B, (Figure 4). Proceed with Step 11.

10. Reconnect the shorter of the two Power Supply cables to the Processor board connector B, (Figure 4).

11. By carefully positioning High Voltage Anode wire into boot, reconnect the the High Voltage Anode Wire to the CRT at point A, (Figure 5). Secure the wire to the wire holders attached to the side of the CRT shield.

12. Reconnect the CRT cable to point B, (Figure 5).

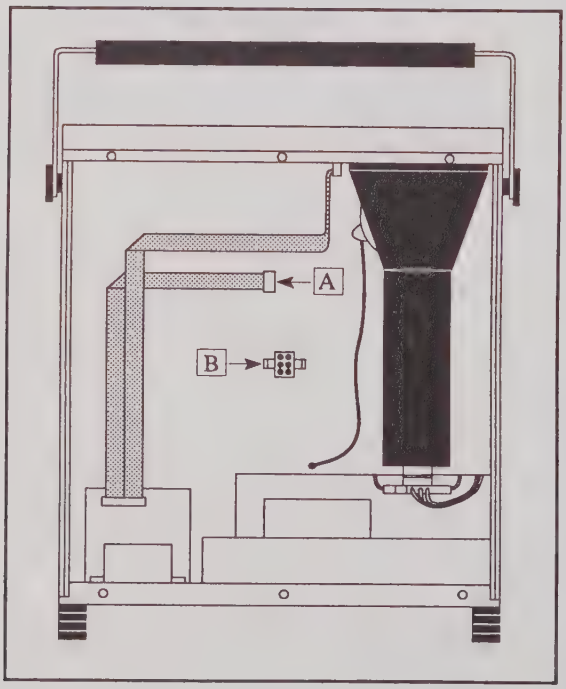


Figure 4

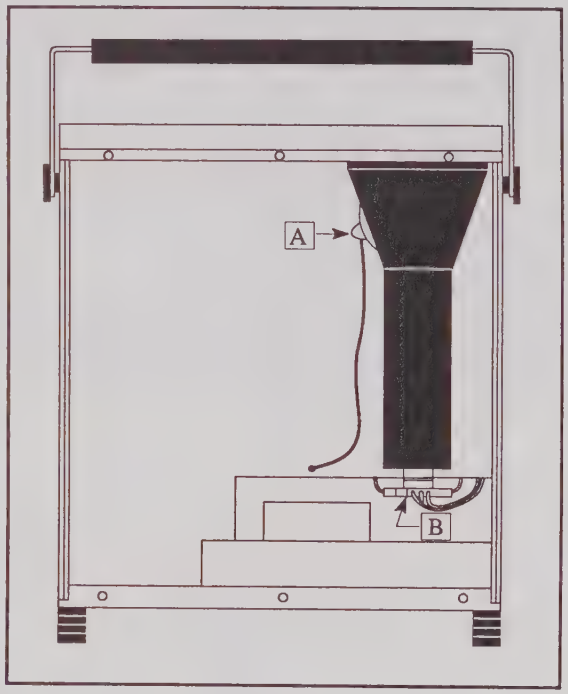


Figure 5

13. Carefully lay the 310 down to rest on its bottom with the Processor board facing the workbench and the rear panel facing you.

14. Insert the plastic insulator (A) into the Pen Speed control opening and secure the Pen Speed knob (B) with a 0.050" hex wrench, (Figure 6).

15. Replace the two RS-232C/Pen Output connector securing screws (C & D) at the rear of the 310, (Figure 6).

> **WARNING:** The processor board is not fully secured. Support the board during Step 16.

16. Perform the Front Panel Reassembly Procedure, page 8-3.

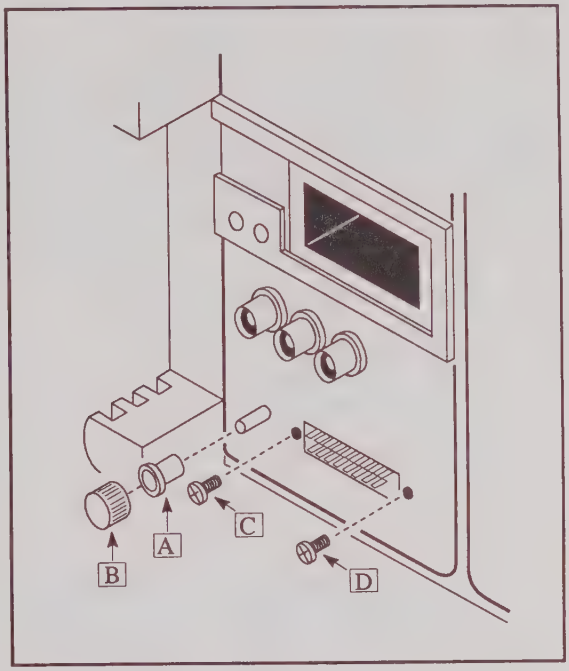


Figure 6

REINSTALLING THE ADC BOARD

This procedure reinstalls the ADC board.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips screwdriver, (#1)
2. Common screwdriver, (3/16")
3. Hex wrench, (3/64")
4. Hex wrench, (1/16")
5. Hex wrench, (5/64")
6. Hex wrench, (1.5mm)
7. Wrench, (1/2")
8. Wrench, (5/16")

Procedure

1. Carefully insert the ADC control shafts into the Front Panel openings.

2. Replace the securing nuts on the DC Offset, Time Per Point, and Expansion switches.

3. Replace and secure the DC Offset, Volts Full Scale, Time Per Point, and Expansion knobs.

4. Replace the channel A and B "Save/On/Off" switch knobs.

> **CAUTION:** Ensure that the wires at the ends of each coaxial cable are properly aligned with the holes in the ADC board when performing Step 5.

5. Reconnect the Trigger-to-ADC coaxial cables to the trigger board connectors A1 through A4, (Figure 1).

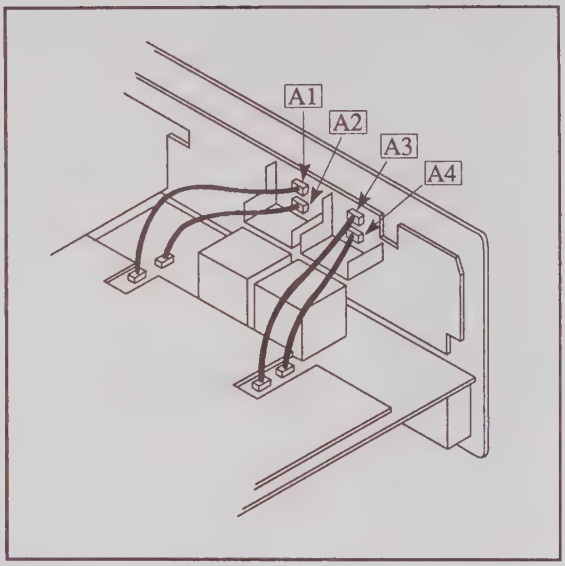


Figure 1

6. Reconnect the Trigger-to-ADC ribbon cable to connector A, (Figure 2).

7. Reconnect the Cursor-to-ADC ribbon cable to connector A, (Figure 3).

8. Carefully turn the Front Panel Assembly over to rest upright.

9. Reconnect the Live/Store LED's-to-ADC board ribbon cable to connector A, (Figure 4).

10. Perform the Front Panel Assembly Reinstallation procedure, (page 8-3).

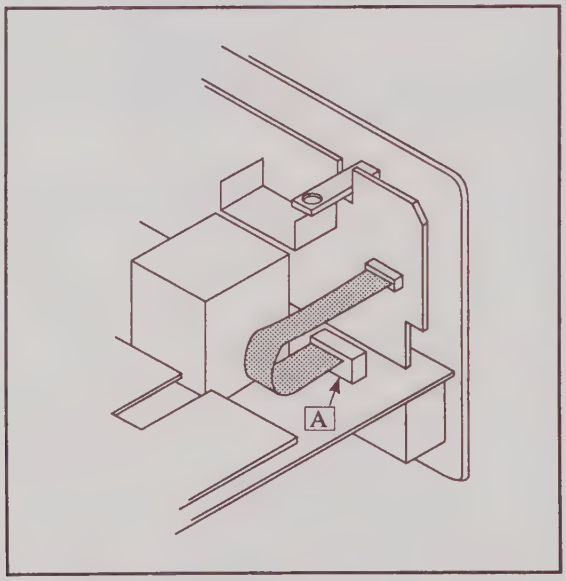


Figure 2

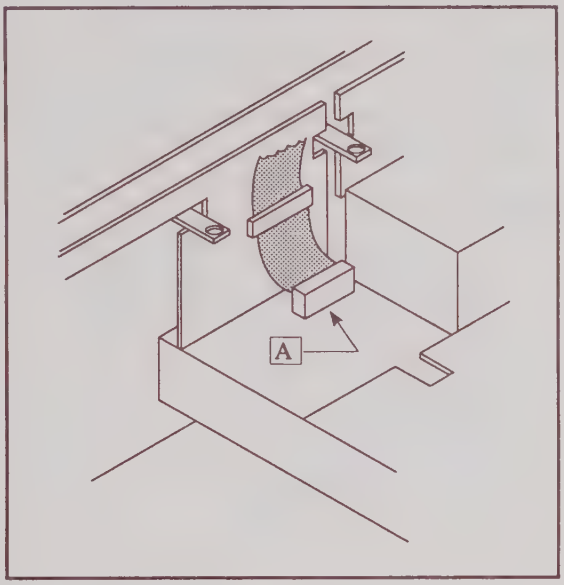


Figure 3

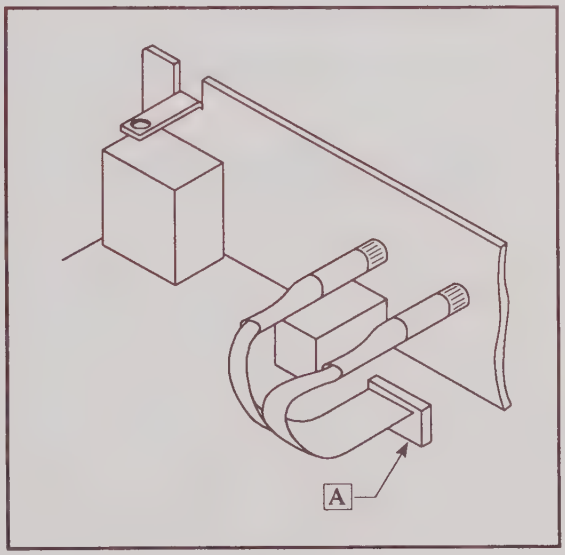


Figure 4

REINSTALLING THE TRIGGER BOARD

This procedure reinstalls the Trigger board.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Soldering Iron
2. Phillips screwdriver, (#1)
3. Common screwdriver, (3/16")
4. Hex wrench, (3/64")
5. Hex wrench, (1/64")
6. Hex wrench, (5/64")
7. Hex wrench, (1.5 mm)
8. Wrench, (1/2")
9. Wrench, (5/16")

Procedure

1. Mount the Trigger board to the Front Panel Assembly and secure with a securing screw and washer set at point A, (Figure 1).

2. Resolder the five BNC connectors to the Trigger board, (Figure 1).

3. Resolder the Auto/Norm LED ribbon cable to the Trigger board, (Figure 2).

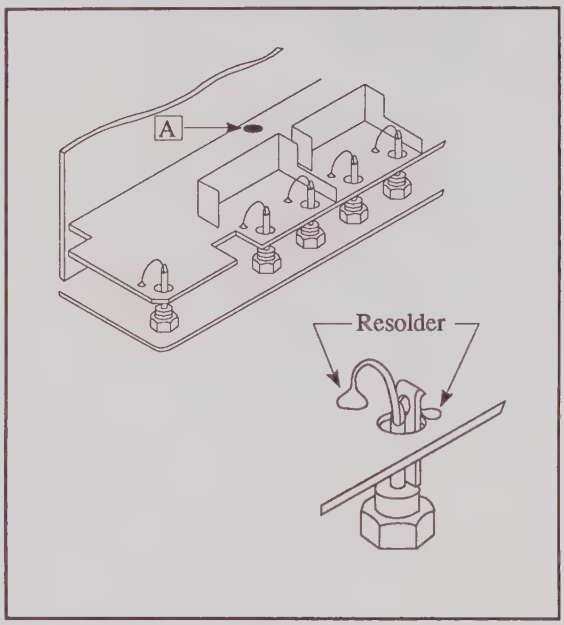


Figure 1

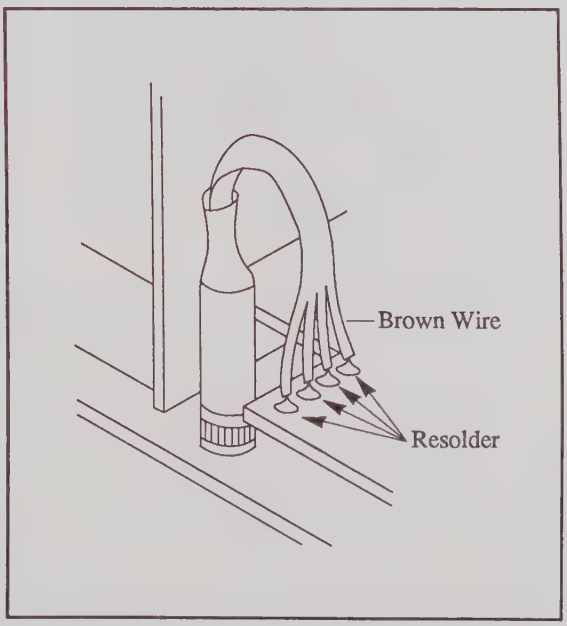


Figure 2

4. Replace the trigger Level switch knob.

5. Replace the (+/-) Slope, DC/AC, Pre-Trigger and A/B/EXT trigger knobs, and the four DC/AC/GND input knobs.

CAUTION: Ensure that the wires at the ends of each coaxial cable are properly aligned with the holes in the ADC and Trigger boards when performing Step 6.

6. Reconnect the Trigger-to-ADC coaxial cables between the Trigger and ADC boards at connectors A1 through A4, (Figure 3).

7. Perform the ADC Board Assembly Reinstallation procedure, (page 8-10).

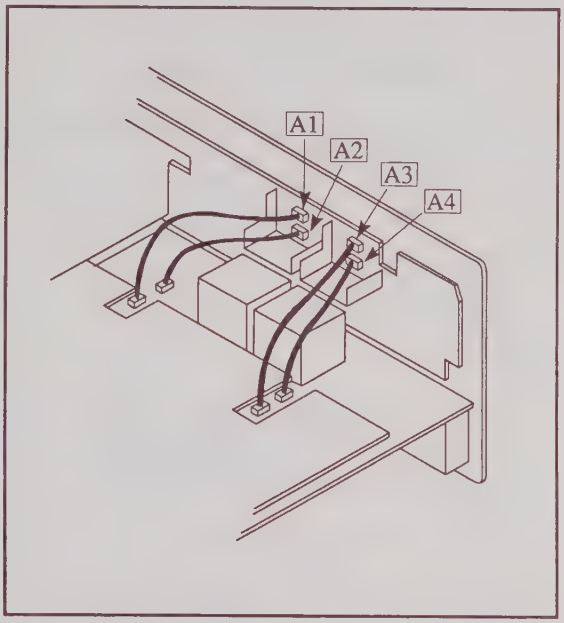


Figure 3

REINSTALLING THE CURSOR BOARD

This procedure reinstalls the cursor board.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips screwdriver, (#1)
2. Hex wrench, (1.5 mm)

Procedure

> **CAUTION:** Perform Step 1 with care to guard against damaging the buttons or printed circuit board.

1. Carefully reassemble the Cursor board to the front panel.

> **CAUTION:** Recover any screws or washers dropped during the next step before continuing.

2. Replace the five Cursor board screw and washer sets.
3. Replace the Autocenter and Display switch knobs.
4. Reconnect the Cursor-to-ADC board ribbon cable to connector A, (Figure 1).
5. Perform the Front Panel Assembly Reinstallation procedure, (page 8-3).

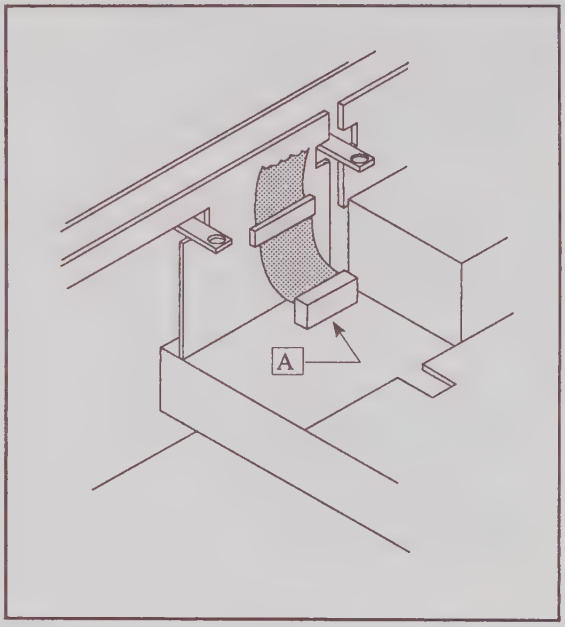


Figure 1

REINSTALLING THE CRT DISPLAY

This procedure reinstalls the CRT.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips screwdriver, (#1)
2. Common screwdriver, (3/16")

Procedure

1. Lay the 310 down to rest on its bottom with the front panel facing to your left.

2. Raise the carrying handle away from the front of the 310.

WARNING: Handle the CRT with care.

3. Carefully slide the CRT into the CRT holder with the High Voltage Anode connector positioned toward the middle of the scope, (Figure 1).

4. Position the carrying handle over the front of the 310.

5. Lay the 310 down to rest on its top.

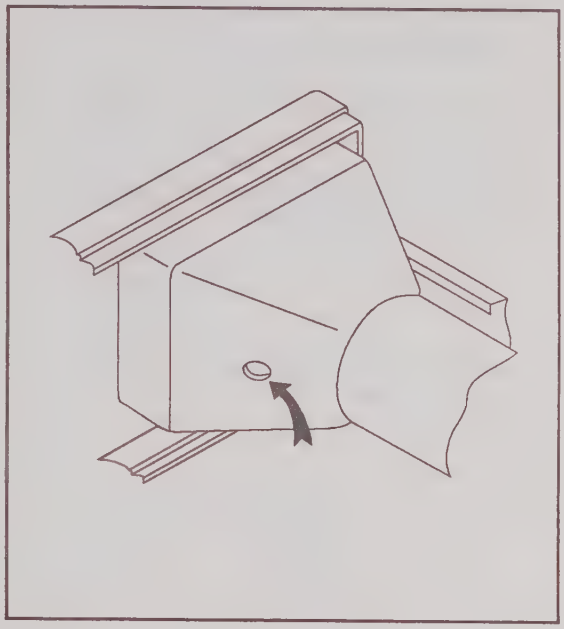


Figure 1

6. Carefully turn the 310 over to rest on its bottom with the front panel facing you.

7. Replace two CRT securing screws at points A and B, (Figure 2).

8. Reconnect the High Voltage Anode wire to the CRT at point A, (Figure 3).

9. Reconnect the CRT cable to the CRT at point B, (Figure 3).

10. Perform the Front Panel Assembly Reinstallation procedure, (page 8-3).

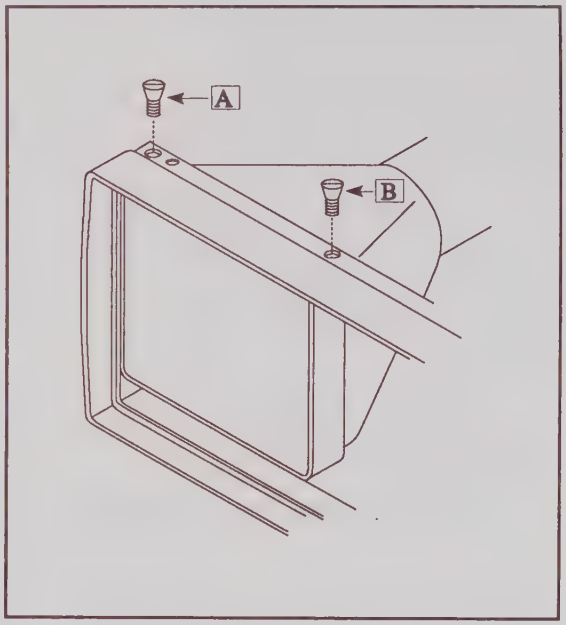


Figure 2

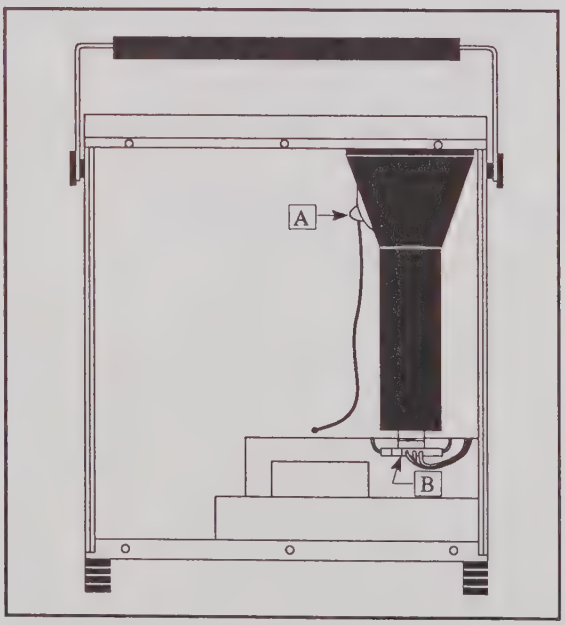


Figure 3

REINSTALLING THE REAR PANEL ASSEMBLY

This procedure reinstalls the Rear Panel Assembly.

IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips screwdriver, (#1).
2. Phillips screwdriver, (#2).
3. Common screwdriver, (3/16").
4. Hex wrench, (0.050").

Procedure

1. Lay the 310 down to rest on its bottom with the front panel facing away from you.
2. Carefully slide the Rear Panel assembly into position and secure it to the frame with four securing screws and washer sets, (Figure 1).
3. Perform the Processor Board Reinstallation procedure, (page 8-6).

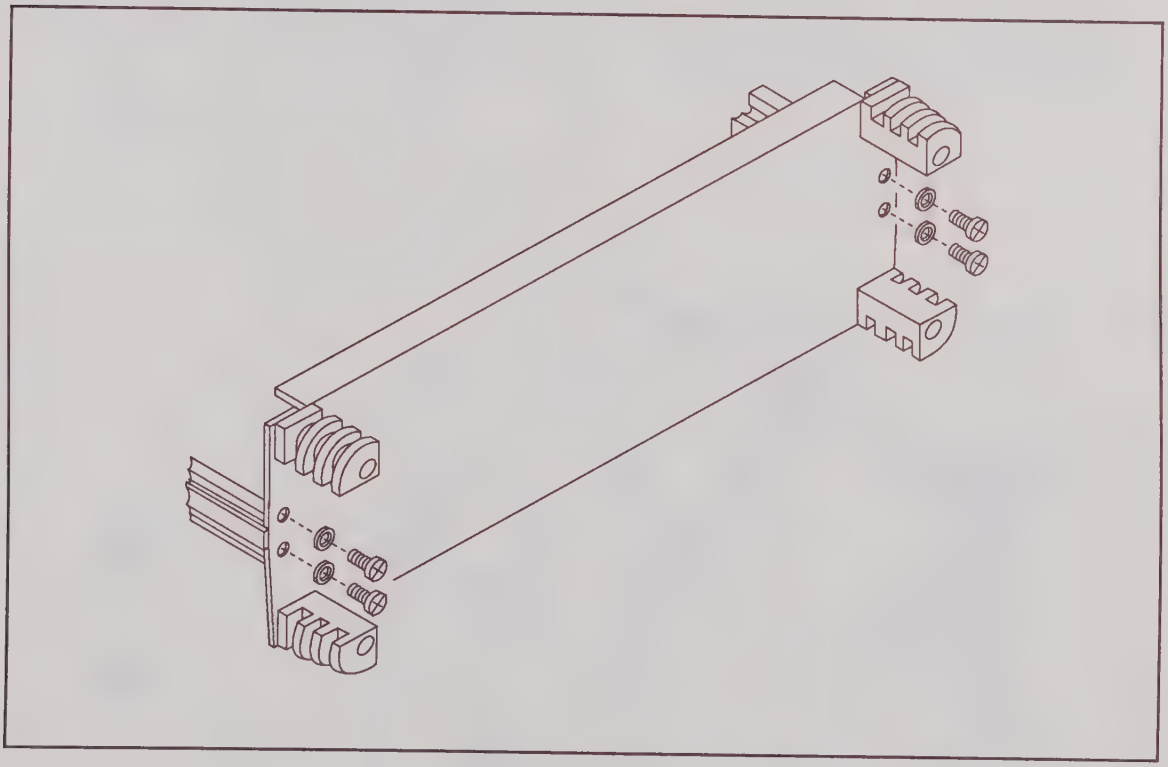


Figure 1

REINSTALLING THE ADVANCED I/O PENTHOUSE AND/OR TOP COVER

This procedure reinstalls the Advanced I/O Penthouse and/or top cover.

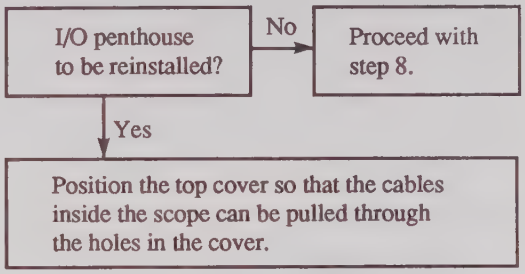
IMPORTANT: Review the Caution notes in Section 4 before proceeding.

Tools Required

1. Phillips screwdriver, (#1).

Procedure

1. Position the carrying handle over the front panel as the instrument rests on its bottom with the rear panel facing you.

3. 
I/O penthouse to be reinstalled?
No
Proceed with step 8.
Yes
Position the top cover so that the cables inside the scope can be pulled through the holes in the cover.

4. Pull power Supply-to-I/O Module cable through opening near P-3 and reconnect to terminal P-7, (Figure 1).

5. Pull the Processor-to-ADC-to-I/O Module ribbon cable through opening near P-3. Reconnect to connector P-3, (Figure 1).

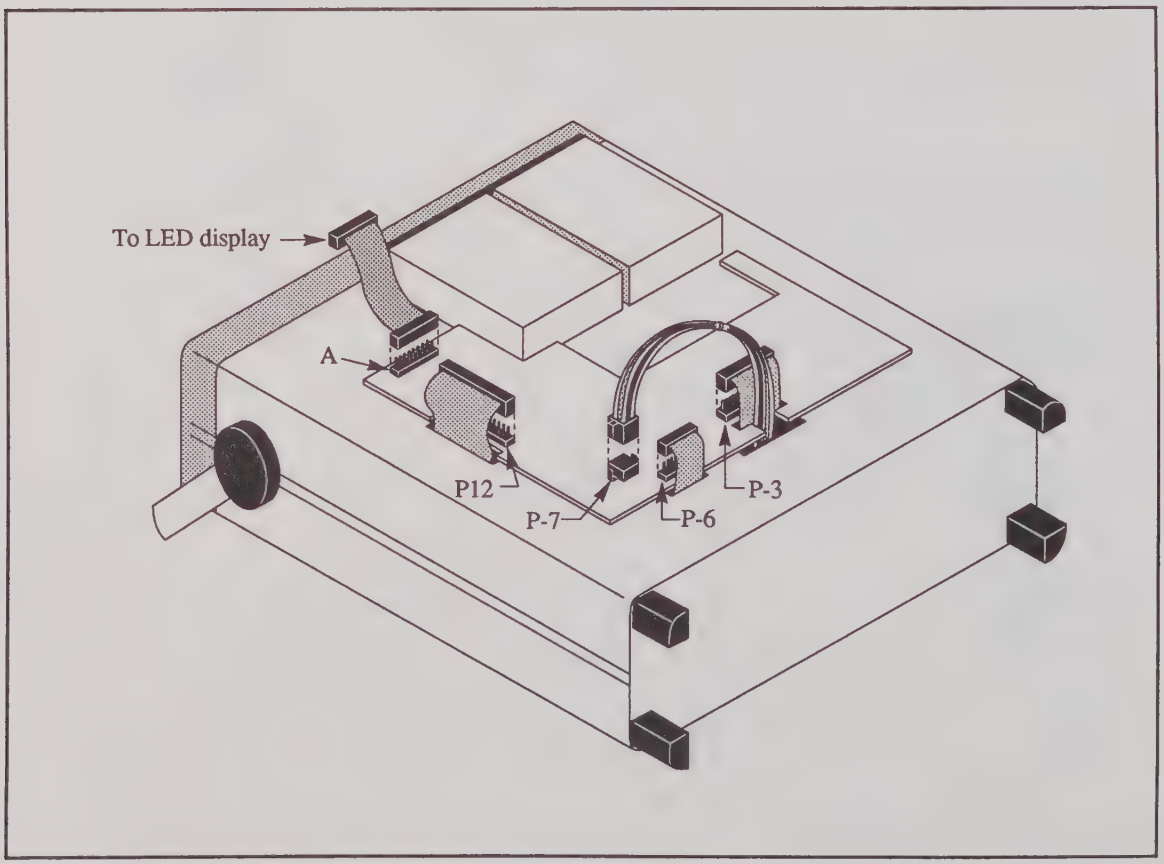


Figure 1

6. Pull the ADC-to-I/O Module ribbon cable through opening near P-6. Reconnect to connector P-6, (Figure 1).

7. Pull the Processor-to-ADC-to-I/O Module ribbon through opening near P12. Reconnect to connector P12, (Figure 1).

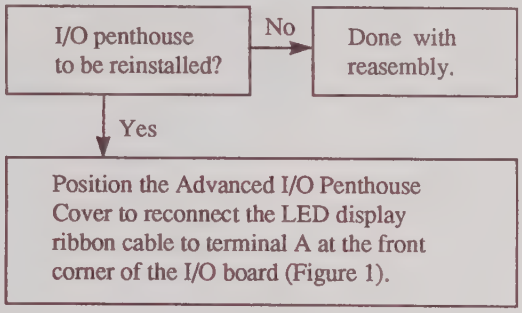
8. Replace the top cover (the larger cover if you also have a top cover for the I/O penthouse option) and secure with the six top cover securing screws as shown in Figure 2.

NOTE: There are three sizes of top cover screws and it is necessary to put them in their respective places as shown in Figure 2.

1-Shortest .....6 x 32 x 3/16"
3-Medium .....6 x 32 x 1/4"
2-Long .....6 x 32 x 3/8"

IMPORTANT: The shortest screw must be placed in the front corner above the CRT. If another screw is substituted here, the instrument could malfunction.

9.


I/O penthouse to be reinstalled?
No
Done with reasembly.
Yes
Position the Advanced I/O Penthouse Cover to reconnect the LED display ribbon cable to terminal A at the front corner of the I/O board (Figure 1).

10. Secure the Advanced I/O Penthouse Cover with four screws.

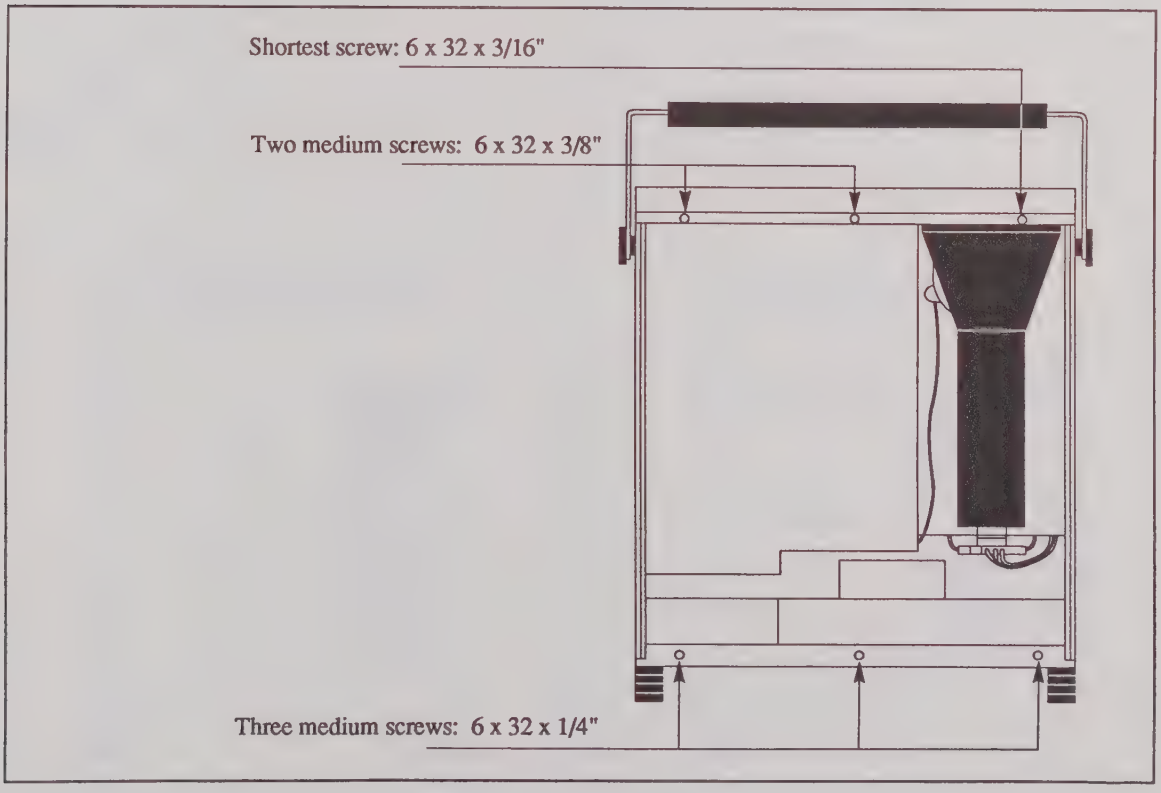


Figure 2

INTRODUCTION

WARNING: High voltages exist within this instrument. Safety standards set by your place of employment should be observed while servicing this instrument.

IMPORTANT: Review the Caution Notes (Section 4) and each procedure in its entirety before proceeding with the actual service steps.

CAUTION: The ADC Gain and Offset Adjusts consist of very complex adjustments that should only be attempted by qualified personnel with a thorough knowledge of the 310's digitizing circuitry. It is recommended that this instrument be returned to a Nicolet service center if the ADC Gain and Offset Check (Section 9) indicates that servicing is required.

In the United States, contact:

Nicolet Instruments Corporation
Test Instruments Division, Service Department
P.O. Box 4288
Madison, WI 53711-0288
Telephone (608) 273-5010

If overseas, contact your local Nicolet representative.

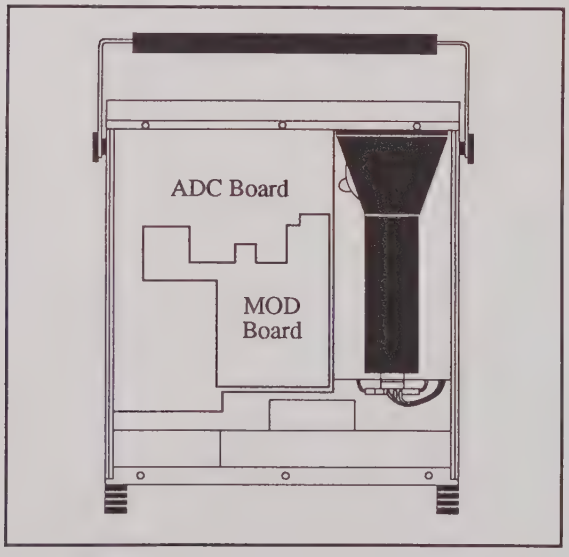


Figure 9-1: ADC Board with Mod Board.

The Alignment and Calibration procedures should be performed once a year (or after servicing the 310) in the order listed in either Table 1 or Table 2.

ADC Board with Mod Board (See Figure 9-1)		
STEPS	**PROCEDURE**	**PAGE**
1.0.0	310 Set-Up	9-3
2.0.0	Voltage Checks	9-4
3.0.0	Balance Adjust	9-8
4.0.0	CMR Adjust	9-10
5.0.0	Gain Calibration	9-12
6.0.0	10V Frequency Compensation	9-16
7.0.0	Time Base Measurement	9-19

Table 1

ADC Board without Mod Board (See Figure 9-2)		
STEPS	**PROCEDURE**	**PAGE**
1.0.0	310 Set-Up	9-21
2.0.0	Voltage Checks	9-22
3.0.0	Balance Adjust	9-26
4.0.0	CMR and Frequency Adjust	9-28
5.0.0	DC Gain Calibration	9-31
6.0.0.	Time Base Measurement	9-34

Table 2

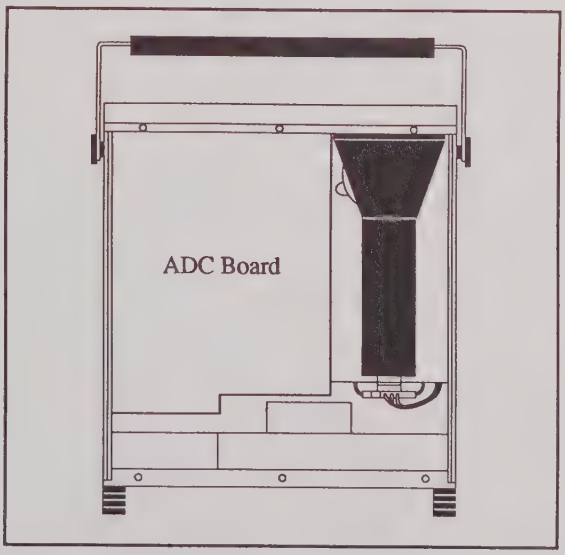


Figure 9-2: ADC Board without Mod Board.

REQUIREMENTS

The 310 oscilloscope should be warmed up for 15 minutes before beginning. In addition, the ambient temperature should be approximately 23°C ±5°C and the relative humidity should not exceed 80%.

The equipment requirements to perform the 310 Adjustment/Calibration procedures include:

Function Generator

a. Ouput: Sine Wave, Square Wave and Triangle Wave.
b. Amplitude: Variable, 75 mV to 20V, (peak-to-peak).
c. Frequency: Variable, 0.2 Hz to 10 KHz.

Digital Multimeter

a. Resolution: 4-1/2 or 5-1/2 digits.
b. Accuracy: 0.05% of input, DC voltage.

Tools

a. Phillips screwdriver, (#1).
b. Small common screwdriver.
c. Nonmetallic Adjustment screwdriver.

Special Equipment

Frequency Compensation Network
See page 9-28, Figure 4-1.

SET-UP

The following 310 control settings should be selected before initiating the first alignment procedure.

1.1.0. DISPLAY CONTROLS

1.1.1.	Horizontal Expansion switch:	OFF
1.1.2.	Vertical Expansion switch:	OFF
1.1.3.	Autocenter switch:	OFF
1.1.4.	Display switch:	Y/T

1.2.0. TIME PER POINT

1.2.1.	Time Per Point switch:	1µS

1.3.0. CHANNEL CONTROLS

1.3.1.	Volts Full Scale switches:	1V
1.3.2.	DC/AC/GND switches:	GND
1.3.3.	Save/On/Off	See (1.5.0)

1.4.0. TRIGGER CONTROLS

1.4.1.	+/- Slope switch:	+
1.4.2.	DC/AC switch:	DC
1.4.3.	Pre-Trig switch	ZERO
1.4.4.	A/B/EXT switch:	EXT
1.4.5.	Auto/Norm switch:	See (1.5.0)

1.5.0. DC OFFSET ZERO ADJUSTS

1.5.1.	Auto/Norm switch:	AUTO
1.5.2.	Save/On/Off switches:	ON
1.5.3.	DC Offset control:	Adjust the channel A and B traces to screen vertical center, (zero Volts).
1.5.4.	Save/On/Off switches:	Ch. B OFF
1.5.5.	Auto/Norm switch:	NORM

1.5.6. Connect the signal generator's Sync signal to the 310's EXT "trigger" BNC, and adjust for stable trigger.

2.0.0. VOLTAGE CHECKS

NOTE: Use a Digital Voltage Meter to measure the voltages in this procedure.

2.1.0. SET-UP

2.1.1. Perform the Set-Up procedure, (Page 9-3).

2.2.0. +12V CHECKS

CAUTION: Use care not to short the test probe against any other components or circuit paths while measuring the +12V test point. If the +12V is lost, check fuse F1 on the ADC board.

2.2.1. Ground the test probe to the 310's ground shield and measure the +12 volt reference at the test point selected from (2.2.3.)

2.2.2.

SPECIFICATION
The meter should range between +12.5 and +11.5 volts. There is no adjustment.

2.2.3.

TEST PINS (See Figure 2-1)	
CHANNEL BEING TESTED	**TEST PIN**
Ch. A Ch. B	U2, Pin 7 U38, Pin 7

2.3.0. -12V CHECK

CAUTION: Use care not to short the test probe against any other components or circuit paths while measuring the -12V test point. If the -12V is lost, check fuse F2 on the ADC board.

2.3.1. Ground the test probe and measure the -12 volt reference at the test point selected from 2.3.3.

2.3.2.

SPECIFICATION
The meter should range between -12.5 and -11.5 volts. There is no adjustment.

2.3.3.

TEST PINS (See Figure 2-1)	
CHANNEL BEING TESTED	**TEST PIN**
Ch. A Ch. B	U2, Pin 4 U38, Pin 4

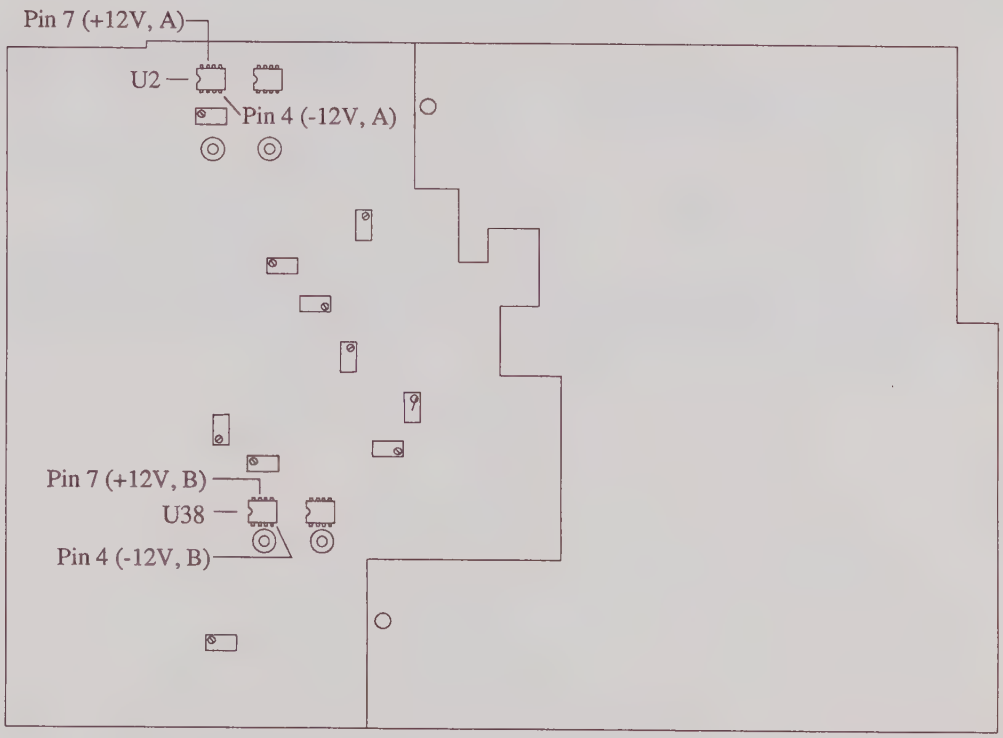


Figure 2-1

2.4.0. +15 VOLT CHECK

CAUTION: Use care not to short the test probe against any other components or circuit paths while measuring the +15V test point. If the +15V is lost check fuse F1 on the ADC Mod board.

2.4.1. Ground the test probe and measure the +15 volt reference at point +15V, (Figure 2-2).

2.4.2.

SPECIFICATION
The meter should range between +15.75 and +14.25 volts. There is no adjustment.

2.5.0. -15 VOLT CHECK

CAUTION: Use care not to short the test probe against any other components or circuit paths while measuring the -15V test point. If the -15V is lost check fuse F2 on the ADC Mod board.

2.5.1. Ground the test probe and measure the -15 volt reference at point -15V, (Figure 2-2).

2.5.2.

SPECIFICATION
The meter should range between -15.75 and -14.25 volts. There is no adjustment.

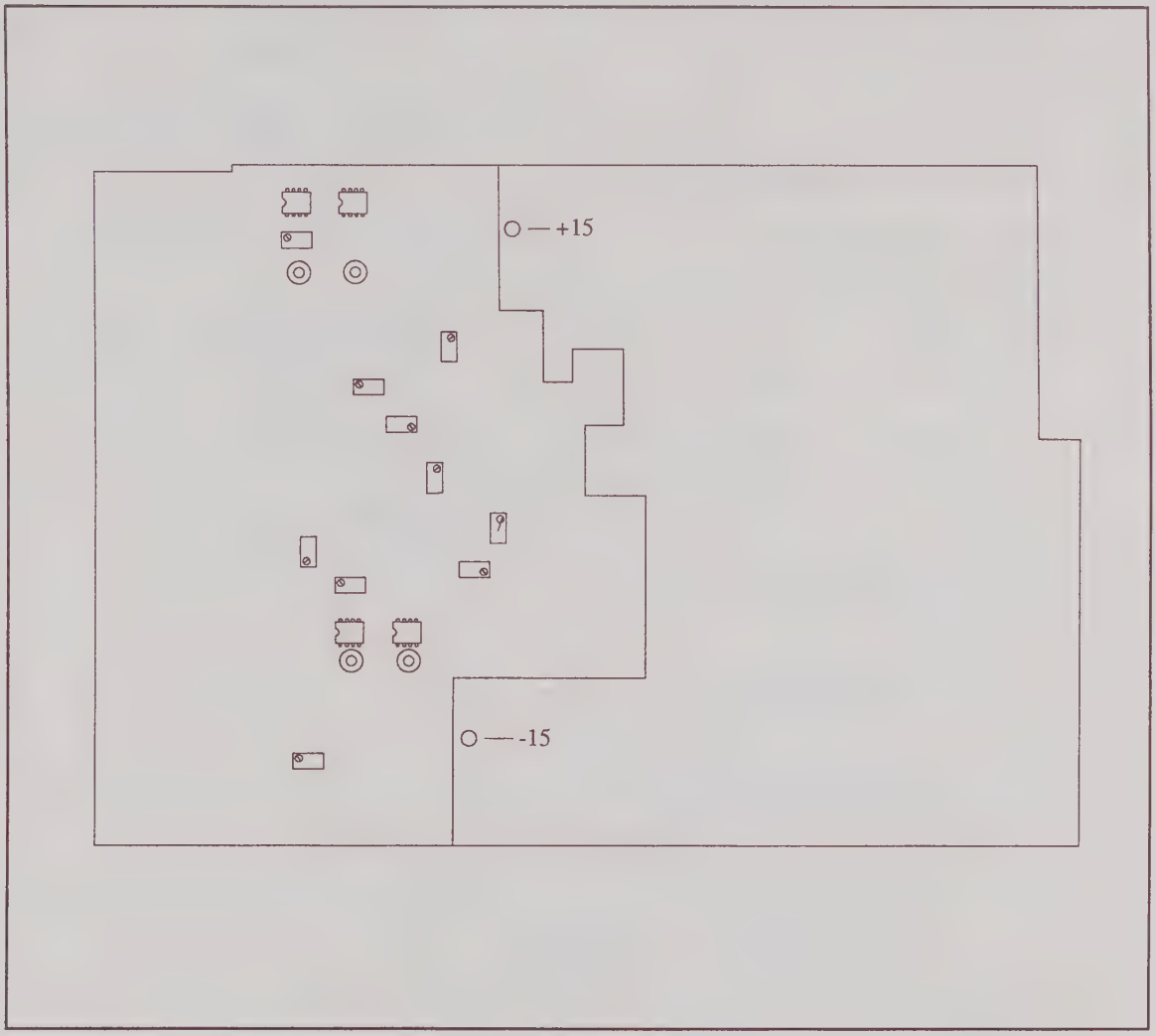


Figure 2-2

3.0.0. BALANCE ADJUST

3.1.0. SET-UP

3.1.1. Perform the Set-Up Procedure, (page 9-3).

3.1.2. Channel A (Save/On/Off): ON

3.2.0. CHANNEL A PROCEDURE: 100mV TO 1V RANGE

3.2.1. Autocenter switch: OFF

3.2.2. Vertical Expansion: Adjust to maximum in the clockwise direction.

3.2.3. Switch the Volts Full Scale switch between the 100mV and 1V ranges while observing the displayed trace.

3.2.4.

SPECIFICATION
Adjust the balance pot selected from (3.2.5.) until the trace does not shift while switching the Volts Full Scale switch.

3.2.5.

BALANCE POTS (See Figure 3-1)	
VOLTS FULL SCALE RANGE	**ADJUST BALANCE POT**
CHANNEL A	
100mV - 1V 4V - 10V	R2 R107
CHANNEL B	
100mV - 1V 4V - 10V	R126 R136

3.3.0. 4V TO 10 V RANGE

3.3.1. Switch the Volts Full Scale switch between the 4V and 10V ranges while observing the displayed trace.

3.3.2. Repeat Steps 3.2.1 through 3.2.5 for this range.

3.4.0. CHANNEL B PROCEDURE: 100mV TO 1 V RANGE and 4V TO 10V RANGE

3.4.1. Channel A (Save/On/Off): OFF

3.4.2. Channel B (Save/On/Off): ON

3.4.3. Repeat Steps 3.2.1 through 3.3.2 for channel B.

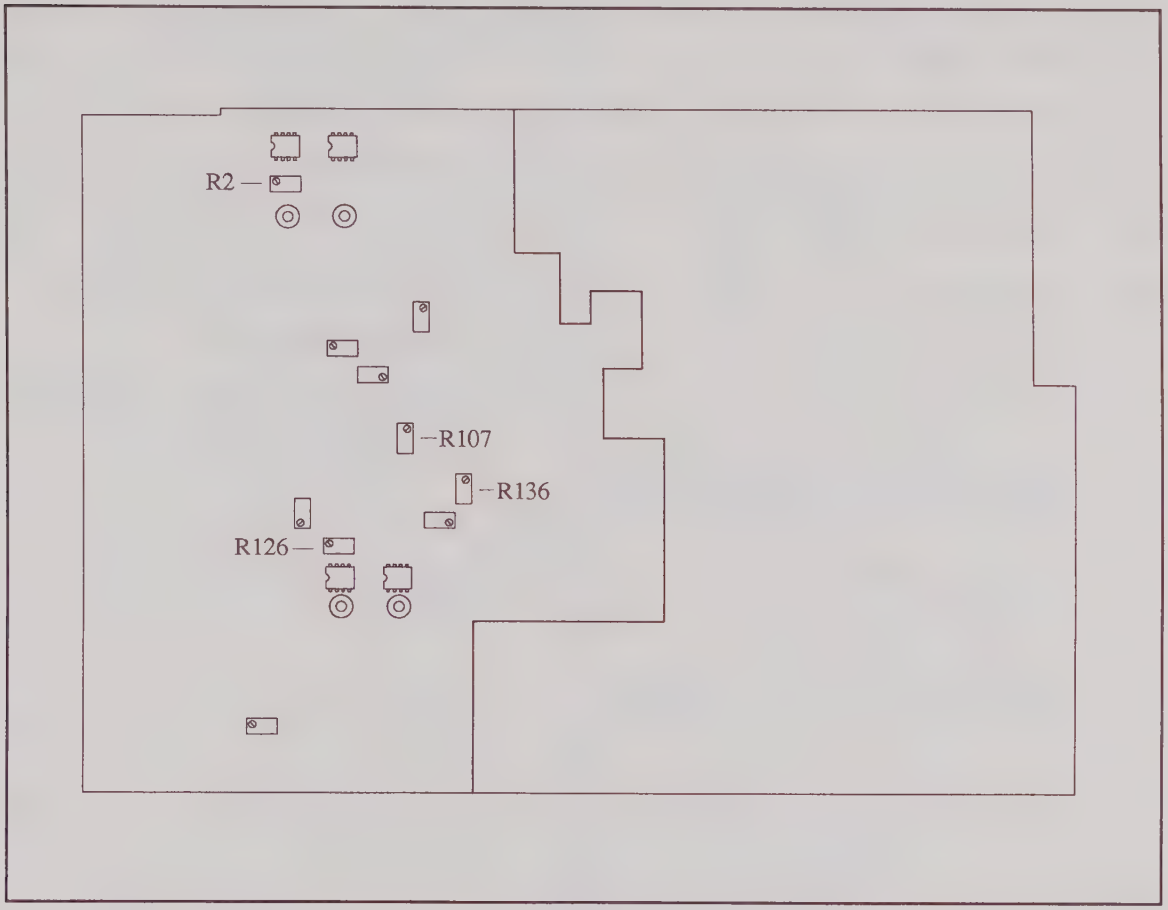


Figure 3-1

4.0.0. CMR ADJUST

4.1.0. SET-UP

4.1.1. Perform the Set-up Procedure, (Page 9-3).

4.1.2. Channel A (Save/On/Off): ON

4.1.3. Autocenter switch: ON

4.1.4. Channel A (+) BNC switch: DC

4.1.5. Channel A (-) BNC switch: GND

4.1.6. Apply a 1 KHz square wave to the Channel A (+) and (-) inputs' BNC's and adjust the square wave for a 4V Peak-to-Peak display.

4.1.7. Channel A (-) BNC switch: DC

4.2.0. CHANNEL A PROCEDURE

4.2.1. Adjust the CMR pot (4.2.2) for a straight line display on the screen.

4.2.2.

CMR POTS (See Figure 4-1)	
CHANNEL BEING ALIGNED	**ADJUST CMR TRIMPOT**
Ch. A	R59
Ch. B	R137

4.2.3. Adjust the Vertical Expansion switch to maximum in the clockwise direction.

4.2.4. Adjust the CMR pot (4.2.2.) until all data points of a common level are in line with each other.

4.3.0. CHANNEL B PROCEDURE

4.3.1. Channel A (Save/On/Off): OFF

4.3.2. Channel B (Save/On/Off): ON

4.3.3. Channel A (+) BNC switch: GND

4.3.4. Channel A (-) BNC switch: GND

4.3.5. Channel B (+) BNC switch: DC

4.3.6. Apply the square wave signal to the Channel B (+) and (-) input BNC's and adjust for a 4V peak to peak display.

4.3.7. Channel B (-) BNC switch: DC

4.3.8. Repeat Steps 4.2.1 through 4.2.4 for channel B.

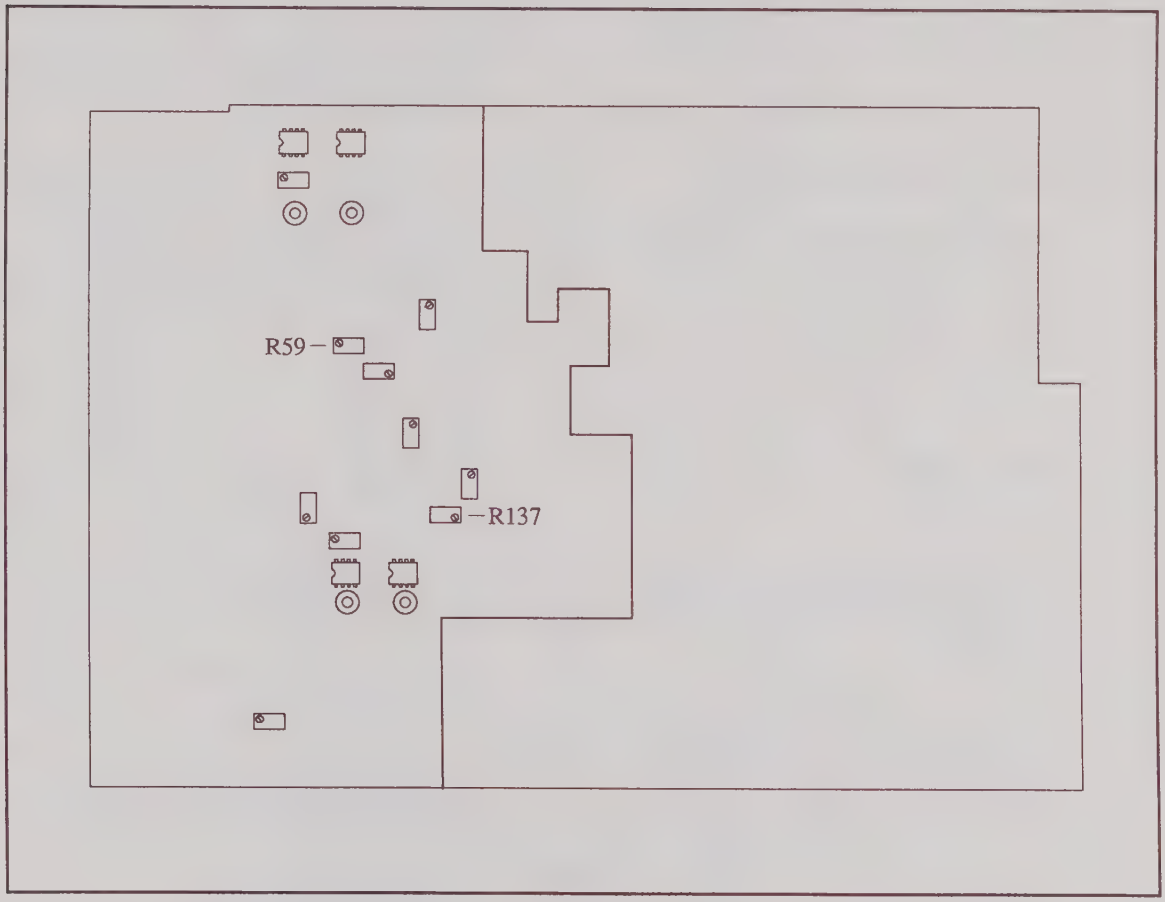


Figure 4-1

ADC with Mod Board Only

5.0.0. GAIN CALIBRATION

5.1.0. SET-UP

NOTE: This procedure requires a multimeter.

5.1.1. Perform the Set-up Procedure, (page 9-3).

5.1.2. Channel A (Save/On/Off): ON

5.1.3. Channel A (+) BNC switch: DC

5.1.4. Time Per Point switch: 1mS

5.1.5. Auto/Norm switch AUTO

5.2.0. PROCEDURE

5.2.1. Position the Volts Full Scale switch accordingly (selected from 5.2.2.) for the procedure to be performed.

5.2.2.

PROCEDURE	VOLTS FULL SCALE SWITCH
1	1V
2	100mV
3	2V
4	4V
5	+10V
6	-10V

5.2.3. Select the Multimeter voltage range accordingly (selected from 5.2.4.) for the procedure being performed.

5.2.4.

VOLTS FULL SCALE SWITCH POSITION	MULTIMETER RANGE SELECTION
1V	0-4V
100mV	0-200mV
2V	0-4V
4V	0-10V
±10V	0-40V

5.2.5. Apply a 0.2 Hz square wave signal to the channel A (+) input BNC and adjust for a 3/4 full scale display.

5.2.6. Apply the same 0.2 Hz square wave signal to the multimeter.

5.2.7. Record both the (+) and (-) multimeter readings and ADD absolute values to obtain the peak-to-peak voltage.

5.2.8. Arm the Hold Next mode:
1. Hold in the Live button.
2. Tap the Hold button.
3. Release the Live button.

NOTE: Wait until the Live LED turns off (sweep completed) before proceeding.

5.2.9. Autocenter switch: ON

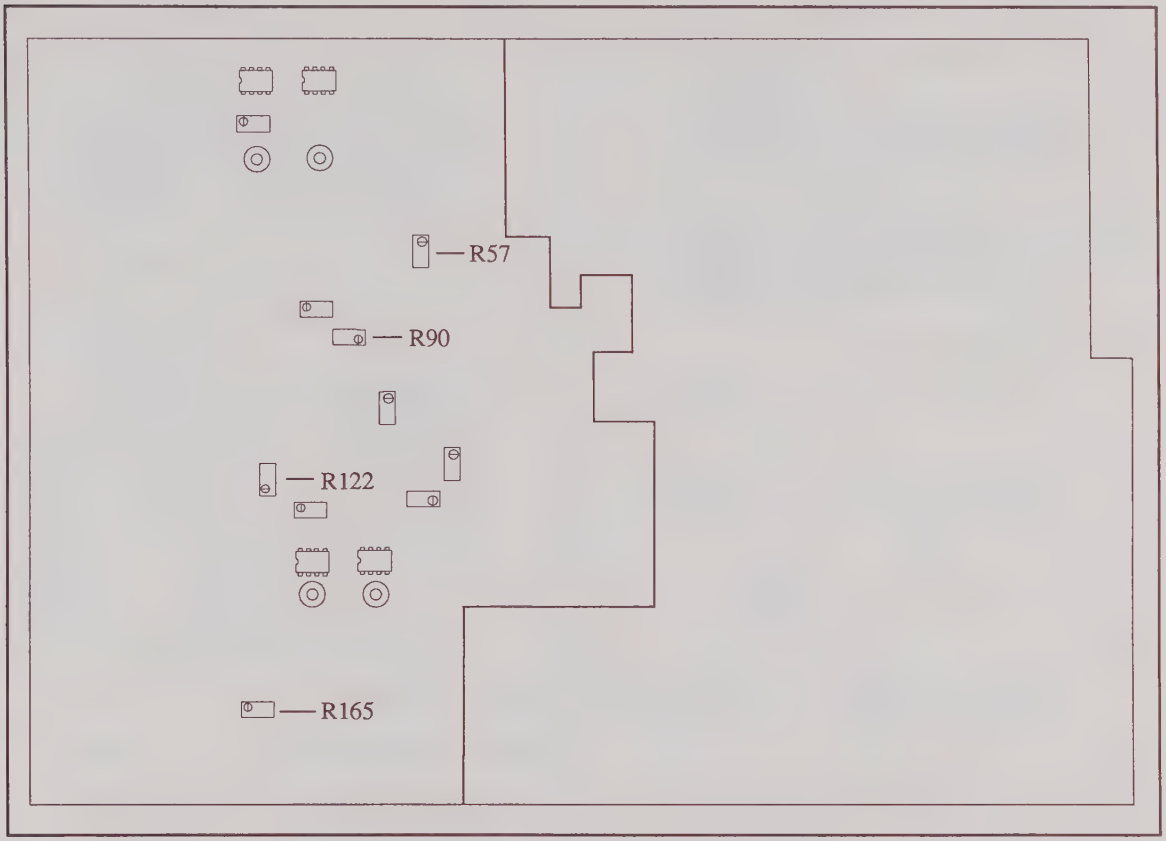


Figure 5-1

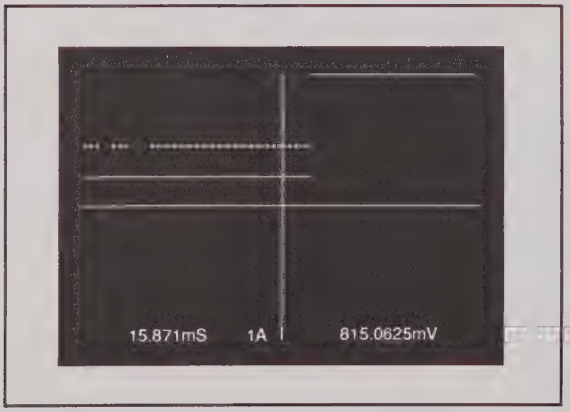


Figure 5-2

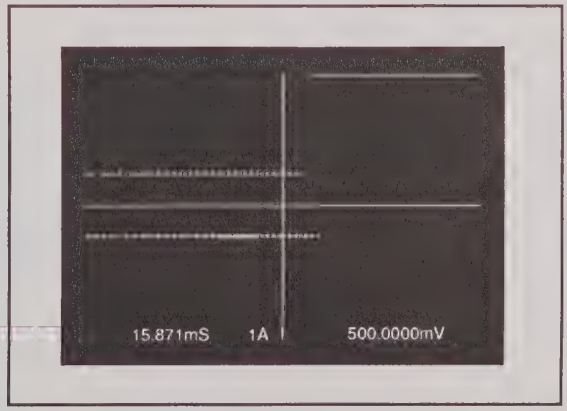


Figure 5-3

5.2.10. Vertical Expansion: Full clockwise position.

Several levels of data points appear on the screen due to "noise," (Figure 5-2).

5.2.11. Position the crosshair over the level containing the majority of data points, (Figure 5-3) by pressing the Left or Right Cursor button.

5.2.12. Press the Reset button.

The Time and Voltage Numerics indicate zero.

5.2.13. Position the crosshair over the opposite peak of the waveform.

5.2.14. Vertical Expansion: Full clockwise position.

5.2.15. Position the crosshair over the level containing the majority of data points by pressing the Left or Right Cursor button.

5.2.16. Record the peak-to-peak voltage displayed by the scope's voltage numerics.

5.2.17. Compute the Percent Error, (Equation 5-1).

5.2.18.

SPECIFICATION
Adjust the appropriate trim pot selected from (5.2.19.) until the Percent Error is less than 0.2%.

5.2.19.

VOLTS FULL SCALE RANGE	TRIM POTS (See Figure 5-1)	
	Ch.A	Ch.B
1V	R57	R165
100mV	R90	R122
2V	no adjust	no adjust
4V	no adjust	no adjust
±10V	no adjust	no adjust

5.2.20. Live button: Press

5.2.21. Vertical Expansion: OFF

5.2.22. Autocenter switch: OFF

5.2.23. Repeat Steps 5.2.1 through 5.2.22 until the Percent Error is less than 0.2%.

$$\text{Percent Error} = \left| \frac{\text{Multimeter (Vpp)} - \text{Scope (Vpp)}}{\text{Multimeter (Vpp)}} \right| \times 100$$

Equation 5-1

5.3.0. 100mV RANGE

5.3.1. Repeat Steps 5.2.1 through 5.2.24 for the 100mV Volts Full Scale range.

5.4.0. 2V, 4V, +10 & -10V RANGES

5.4.1. Repeat Steps 5.2.1 through 5.2.18 then Steps 5.2.21 through 5.2.23 for the next Volts Full Scale range listed in (5.2.2.).

NOTE: This is a Gain Calibration Check **only** for the 2V, 4V, +10V & -10V ranges. There are no adjustments to be made for these ranges.

ADC with Mod Board Only

6.0.0. 10V FREQUENCY COMPENSATION

6.1.0. SET-UP

6.1.1. Perform the Set-up Procedure, (page 9-3).

6.1.2. Volts Full Scale switches: 10V

6.1.3. Channel A (Save/On/Off): ON

6.1.4. Channel A (+) BNC switch: DC

6.1.5. Autocenter switch: ON

6.1.6. Apply a 10 KHz square wave to the (+) input BNC and adjust for a 3/4 full screen display.

6.1.7. Remove the square wave signal and reapply it to the (+) input BNC using the Frequency Compensation Network, (Figure 6-2).

6.2.0. CHANNEL A COMPENSATION

6.2.1. Adjust the DC Offset control until the trace is centered vertically on the screen.

6.2.2. Vertical Expansion: Adjust to maximum in the clockwise direction.

6.2.3. Horizontal Expansion: Turn switch 9 "clicks" clockwise from the OFF position.

6.2.4. Position the cursors to the negative portion of the waveform (See Figure 6-3.) by pressing the left or right Cursor move button.

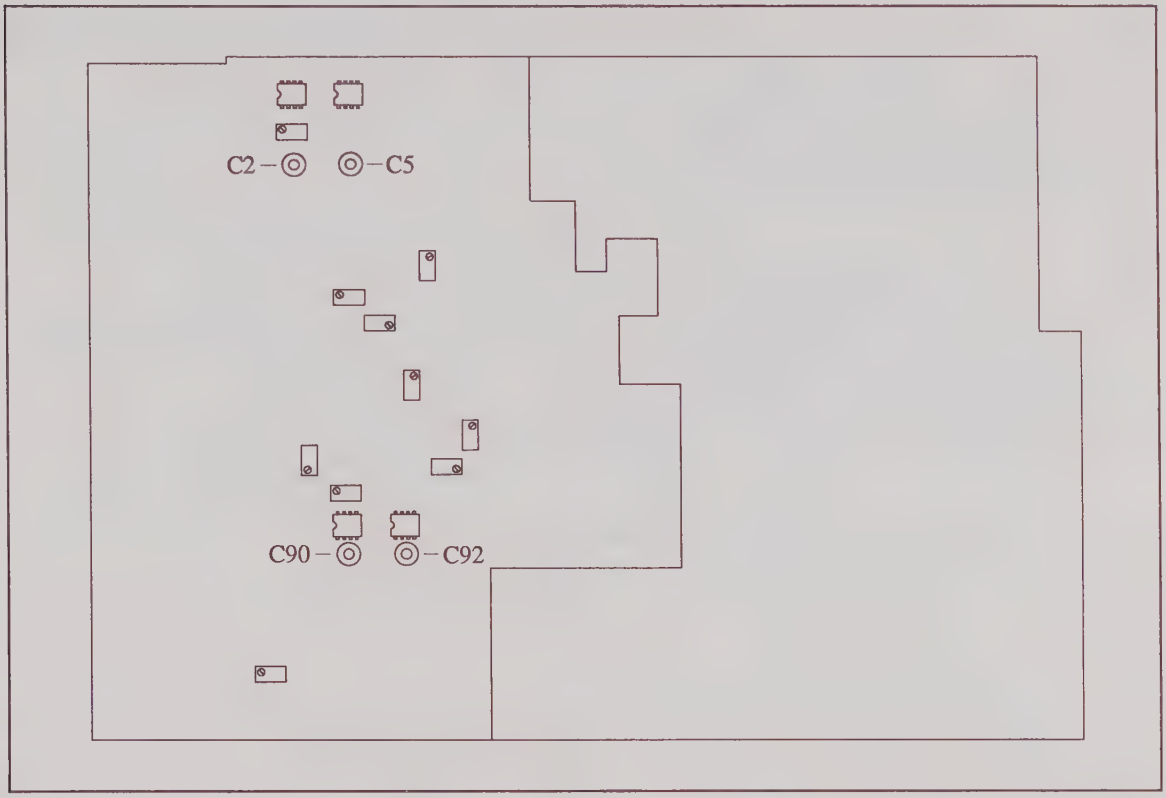


Figure 6-1

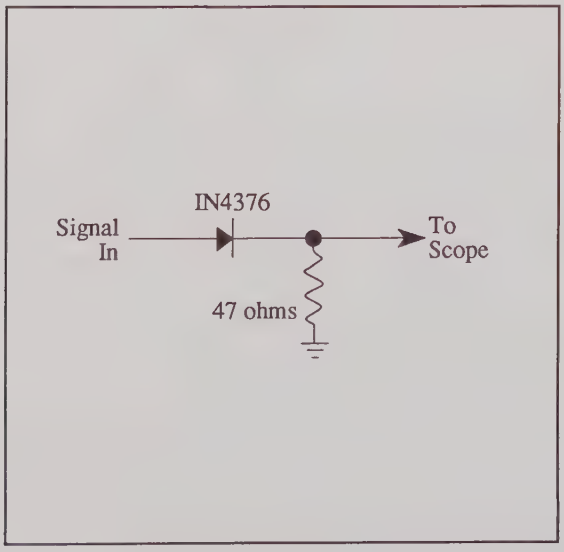


Figure 6-2

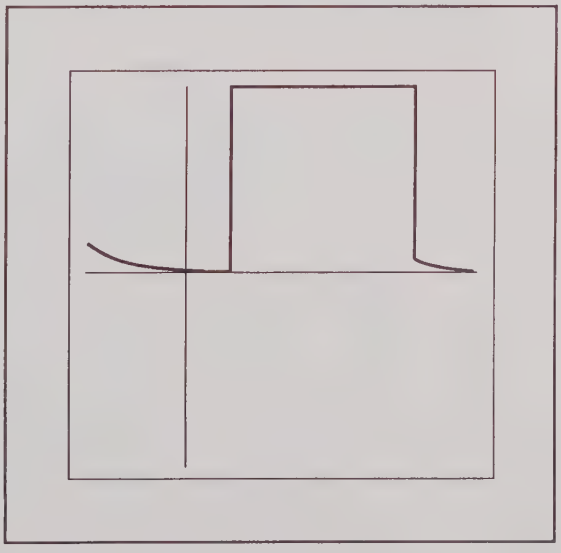


Figure 6-3

6.2.5.

SPECIFICATION
Adjust the Compensation Capacitor (7.2.6) for the best square wave, (minimum overshoot or undershoot).

6.2.6.

COMPENSATION CAPS (See Figure 6-1)		
CHANNEL BEING ALIGNED	SIGNAL INPUT TO	
	(+) BNC	(-) BNC
CH. A	C2	C5
CH. B	C90	C92

6.2.7. Channel's (+) BNC switch: GND

6.2.8. Channel's (-) BNC switch: DC

6.2.9. Move the square wave signal to the (-) input BNC using the Frequency Compensation Network.

6.2.10. Repeat Steps 6.2.1 through 6.2.6 for the (-) input BNC, observing the positive portion of the waveform.

6.3.0. CHANNEL B COMPENSATION

6.3.1. Channel A (Save/On/Off): OFF

6.3.2. Channel B (Save/On/Off): ON

6.3.3. Channel A (-) BNC switch: GND

6.3.4. Channel B (+) BNC switch: DC

6.3.5. Move the square wave signal to the Channel B (+) input BNC using the Frequency Compensation Network.

6.3.6. Repeat Steps 6.2.1. through 6.2.10 for the channel B 10V Frequency Compensation.

7.0.0. TIME BASE MEASUREMENT

NOTE: Use a Calibrated Digital Frequency Counter in this procedure.

7.1.0. SET-UP

7.1.1. Turn on the 310 and allow it to warm up.

7.2.0. PROCEDURE

NOTE: No adjustments are performed in this test.

7.2.1. Measure the frequency (Time Base) at U74, Pin 11 on the processor board. (See Figure 7-1).

7.2.2.

SPECIFICATION
The measured frequency should be no greater than 36.0036 MHz or less than 35.9964 MHz.

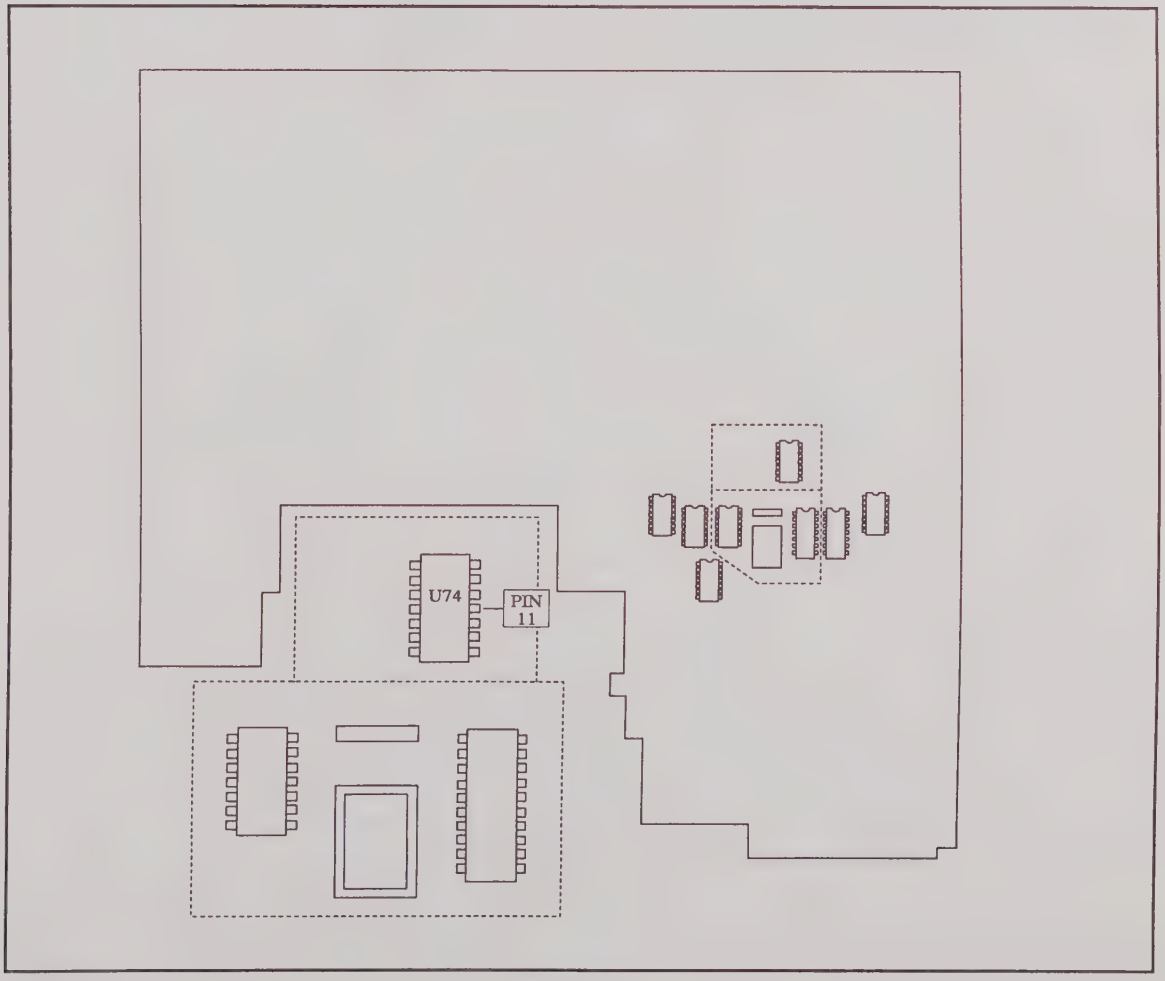


Figure 7-1

SET-UP

The following 310 control settings should be selected before initiating the first alignment procedure.

1.1.0.	**DISPLAY CONTROLS**	
1.1.1.	Horizontal Expansion switch:	OFF
1.1.2.	Vertical Expansion switch:	OFF
1.1.3.	Autocenter switch:	OFF
1.1.4.	Display switch:	Y/T
1.2.0.	**TIME PER POINT**	
1.2.1.	Time Per Point switch:	1µS
1.3.0.	**CHANNEL CONTROLS**	
1.3.1.	Volts Full Scale switches:	1V
1.3.2.	DC/AC/GND switches:	GND
1.3.3.	Save/On/Off	See (1.5.0)
1.4.0.	**TRIGGER CONTROLS**	
1.4.1.	+/- Slope switch:	+
1.4.2.	DC/AC switch:	DC
1.4.3.	Pre-Trig switch	ZERO
1.4.4.	A/B/EXT switch:	EXT
1.4.5.	Auto/Norm switch:	See (1.5.0)
1.5.0.	**DC OFFSET ZERO ADJUSTS**	
1.5.1.	Auto/Norm switch:	AUTO
1.5.2.	Save/On/Off switches:	ON
1.5.3.	DC Offset control:	Adjust the channel A and B traces to screen vertical center, (zero Volts).
1.5.4.	Save/On/Off switches:	Ch. B OFF
1.5.5.	Auto/Norm switch:	NORM
1.5.6.	Connect the signal generator's Sync signal to the 310's EXT "trigger" BNC, and adjust for stable trigger.	

2.0.0. ADC BOARDVOLTAGE CHECKS

NOTE: Use a Digital Voltage Meter to measure the voltages in this procedure.

2.1.0. SET-UP

2.1.1. Perform the Set-Up procedure, (Page 9-21).

2.2.0. +12V CHECKS ON ADC BOARD

CAUTION: Use care not to short the test probe against any other components or circuit paths while measuring the +12V test point.

2.2.1. Ground the test probe to the 310's ground shield and measure the +12 volt reference at the test point selected from (2.2.3.)

2.2.2.

SPECIFICATION
The meter should range between +12.5 and +11.5 volts. There is no adjustment.

2.2.3.

TEST PINS (See Figure 2-1)	
CHANNEL BEING TESTED	**TEST PIN**
Ch. A Ch. B	U3, Pin 4 U26, Pin 4

2.3.0. -12V CHECK ON ADC BOARD

CAUTION: Use care not to short the test probe against any other components or circuit paths while measuring the -12V test point.

2.3.1. Ground the test probe and measure the -12 volt reference at the test point selected from 2.3.3.

2.3.2.

SPECIFICATION
The meter should range between -12.5 and -11.5 volts. There is no adjustment.

2.3.3.

TEST PINS (See Figure 2-1)	
CHANNEL BEING TESTED	**TEST PIN**
Ch. A Ch. B	U3, Pin 11 U26, Pin 11

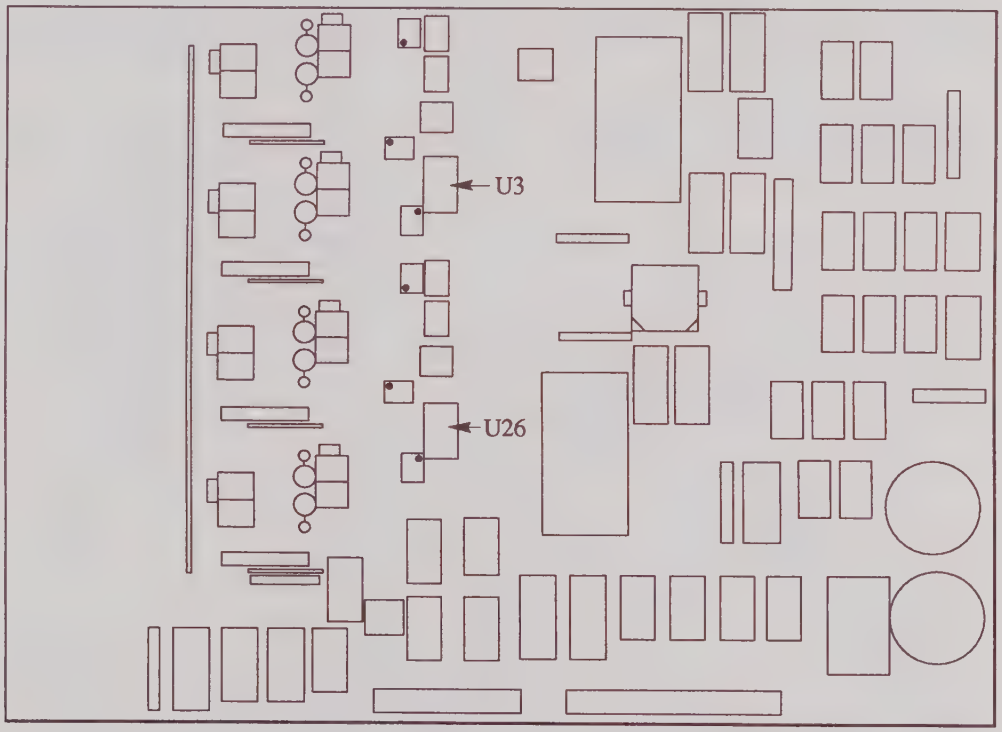


Figure 2-1: ±12 V Voltage Test Points on ADC Board without Mod Board.

2.4.0. +12V CHECKS ON PROCESSOR BOARD

CAUTION: Use care not to short the test probe against any other components or circuit paths while measuring the +12V test point.

2.4.1. Remove the six screws securing the bottom cover and set the cover aside.

2.4.2. Ground the test probe to the 310's ground shield and measure the +12 volt reference at the test point selected from (2.4.3.)

2.4.3.

SPECIFICATION
The meter should range between +12.5 and +11.5 volts. There is no adjustment.

2.4.4.

TEST PINS (See Figure 2-2)	
VOLTS BEING TESTED	**TEST PIN**
+ 12 V	U49, Pin 7

2.5.0. -12V CHECK

CAUTION: Use care not to short the test probe against any other components or circuit paths while measuring the -12V test point.

2.5.1. Ground the test probe and measure the -12 volt reference at the test point selected from 2.3.3.

2.5.2.

SPECIFICATION
The meter should range between -12.5 and -11.5 volts. There is no adjustment.

2.5.3.

TEST PINS (See Figure 2-2)	
VOLTS BEING TESTED	**TEST PIN**
-12 V	U49, Pin 9

2.5.4. Replace the bottom cover and secure with the six bottom cover securing screws.

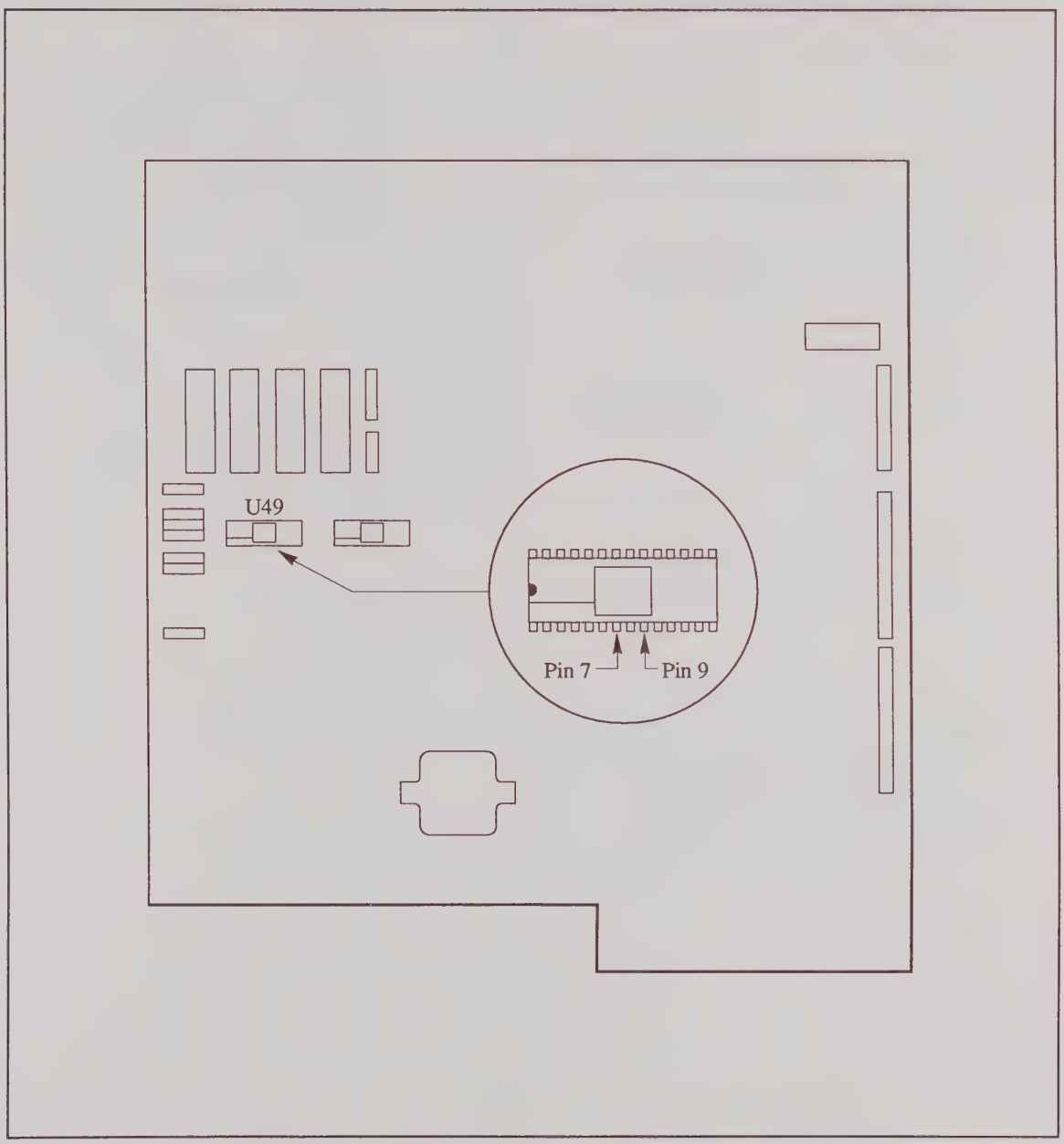


Figure 2-2: Figure 2-1: ±12 V Voltage Test Points on Processor Board.

3.0.0. BALANCE ADJUST

3.1.0. SET-UP

3.1.1. Perform the Set-Up Procedure, (page 9-21).

3.1.2. Channel A (Save/On/Off): ON

3.2.0. CHANNEL A PROCEDURE: 4V TO 10V RANGE

3.2.1. Autocenter switch: ON

3.2.2. Vertical Expansion: Adjust to maximum in the clockwise direction.

3.2.3. Autocenter switch: OFF

3.2.4. Switch the Volts Full Scale switch between the 4V and 10V ranges while observing the displayed trace.

3.2.5.

SPECIFICATION
Adjust the balance pot selected from (3.2.5.) until the trace does not shift while switching the Volts Full Scale switch.

3.2.6.

VOLTS FULL SCALE RANGE	BALANCE POTS (See Figure 3-1)	
	Ch.A	Ch.B
4V - 10V	R7	R61

3.3.0. CHANNEL B PROCEDURE: 4V TO 10V RANGE

3.3.1. Channel A (Save/On/Off): OFF

3.3.2. Channel B (Save/On/Off): ON

3.3.3. Repeat Steps 3.2.1 through 3.2.6 for channel B.

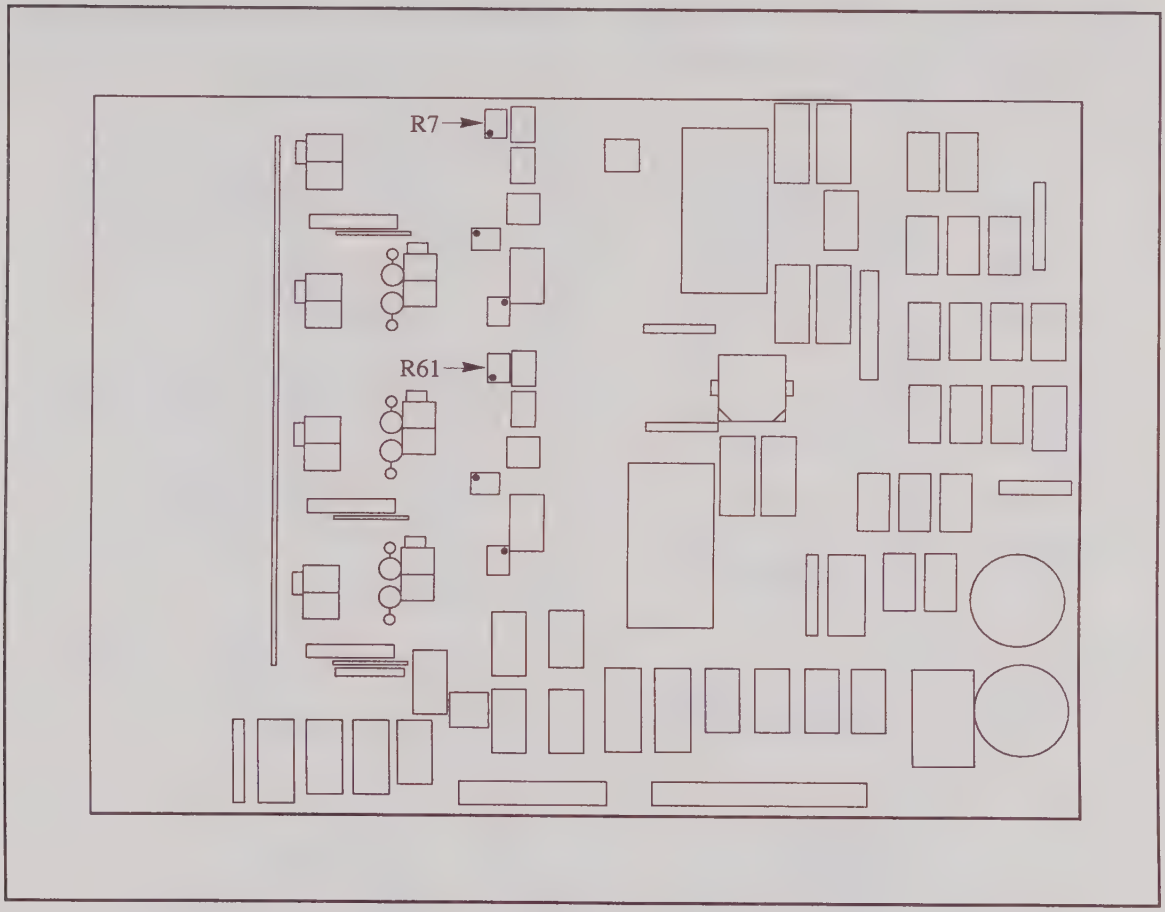


Figure 3-1: Balance Adjustments on ADC without Mod Board.

ADC without Mod Board Only

4.0.0. CMR & FREQUENCY COMPENSATION ADJUST

4.1.0. SET-UP

4.1.1. Perform the Set-up Procedure, (Page 9-21).

4.1.2. Channel A (Save/On/Off): ON

4.1.3. Volts Full Scale Switch: 100mV

4.1.4. Autocenter switch: ON

4.1.5. Channel A (+) BNC switch: DC

4.1.6. Channel A (-) BNC switch: DC

4.1.7. Apply a 1 KHz, 10V p-p sine wave to the Channel A (+) and (-) input BNC's.

4.2.0. CMR PROCEDURE

4.2.1. Adjust the CMR pot (4.2.2) for a straight line (minimum amplitude) display on the screen.

4.2.2.

CMR POTS (See Figure 4-3)	
CHANNEL BEING ALIGNED	**ADJUST CMR TRIMPOT**
Ch. A Ch. B	R46 R103

4.2.3. Adjust the Vertical Expansion switch to maximum in the clockwise direction.

4.2.4. Adjust the CMR pot (4.2.2.) until all data points of a common level are in line with each other.

4.3.0. 1V FREQUENCY COMPENSATION PROCEDURE

4.3.1. Volts Full Scale Switch: 1V

4.3.2. Channel A (Save/On/Off): ON

4.3.3. Channel A (+) BNC switch: DC

4.3.4. Autocenter switch: ON

4.3.7. Apply a 10 KHz square wave to the (+) input BNC and adjust for a 3/4 full screen display.

4.3.8.. Remove the square wave signal and reapply it to the (+) input BNC using the Frequency Compensation Network, (Figure 4-1).

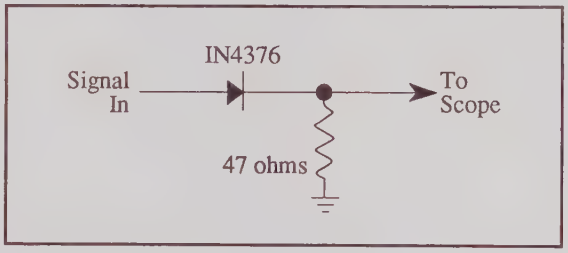


Figure 4-1

4.4.0. CHANNEL A COMPENSATION

4.4.1. Adjust the DC Offset control until the trace is centered vertically on the screen.

4.4.2. Vertical Expansion: Adjust to maximum in the clockwise direction.

4.4.3. Horizontal Expansion: Turn switch 9 "clicks" clockwise from the OFF position.

4.4.4. Position the cursors to the negative portion of the waveform (See Figure 4.2.) by pressing the left or right Cursor move button.

4.4.5.

SPECIFICATION
Adjust the Compensation Capacitor (4.4.6) for the best square wave, (minimum overshoot or undershoot).

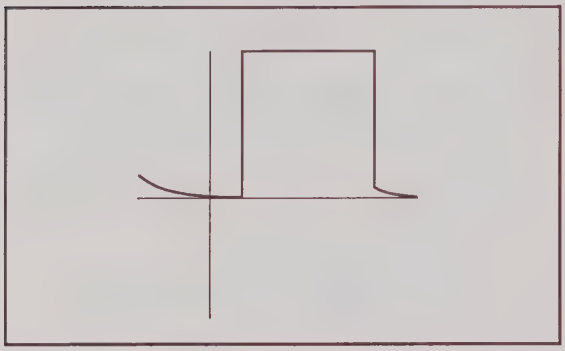


Figure 4-2

4.4.6.

COMPENSATION CAPS (See Figure 4-3)		
CHANNEL BEING ALIGNED	**VOLTAGE RANGE**	**ADJUST CAP**
Ch. A	+1V -1V +10V -10V	C13 C72 C9 C66
Ch. B	1V -1V +10V -10V	C111 C142 C105 C136

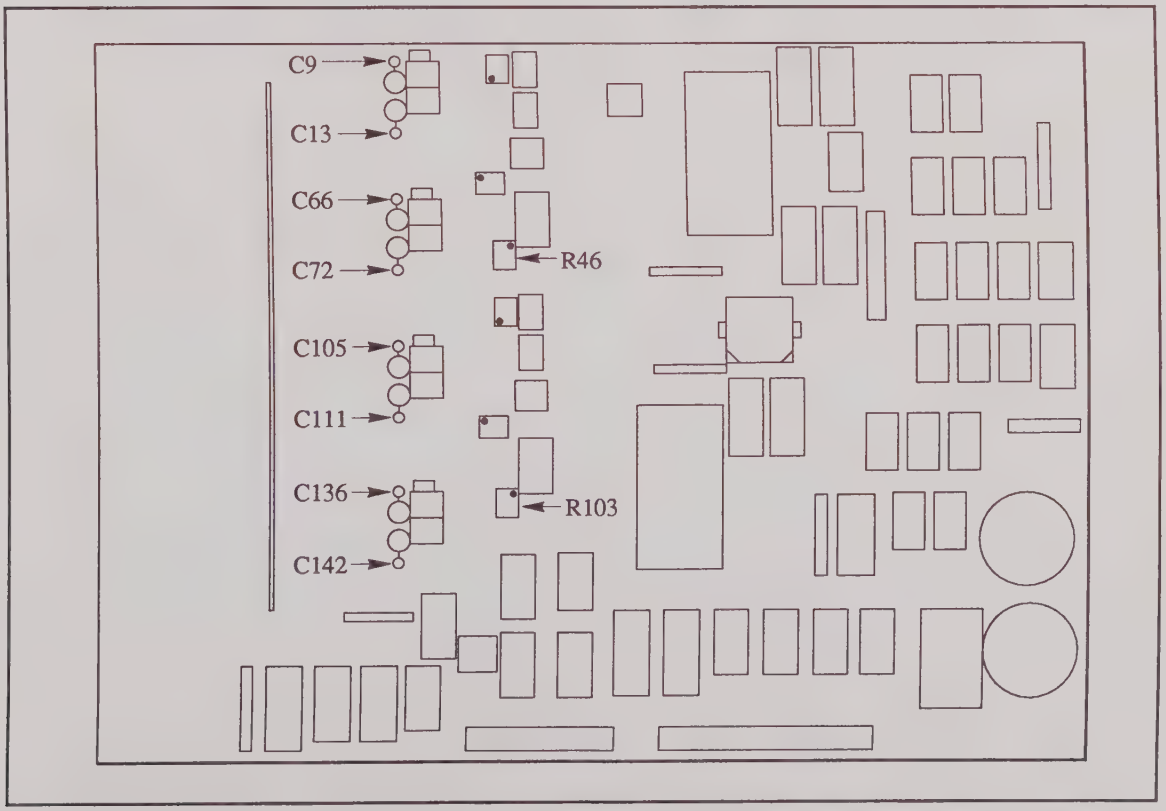


Figure 4-3: CMR Adjustment Pots & Frequency Compensation Capacitors for ADC without Mod Board.

4.4.7. Channel's (+) BNC switch: GND

4.4.8. Channel's (-) BNC switch: DC

4.4.9. Move the square wave signal to the (-) input BNC using the Frequency Compensation Network.

4.4.10. Repeat Steps 4.4.1 through 4.4.5 for the (-) input BNC, observing the positive portion of the waveform.

4.5.0. CHANNEL B COMPENSATION

4.5.1. Channel A (Save/On/Off): OFF

4.5.2. Channel B (Save/On/Off): ON

4.5.3. Channel A (-) BNC switch: GND

4.5.4. Channel B (+) BNC switch: DC

4.5.5. Move the square wave signal to the Channel B (+) input BNC using the Frequency Compensation Network.

4.5.6. Repeat Steps 4.4.1 through 4.4.8 for the channel B 1V Frequency Compensation.

4.6.0. 10V FREQUENCY COMPENSATION PROCEDURE

4.6.1. Volts Full Scale Switch: 10V

4.6.2. Repeat Steps 4.3.2 through 4.5.6 for the 10V Full Scale Range.

5.0.0. DC GAIN CALIBRATION

5.1.0. SET-UP

NOTE: This procedure requires a multimeter.

5.1.1. Perform the Set-up Procedure, (page 9-21).

5.1.2. Channel A (Save/On/Off): ON

5.1.3. Channel A (+) BNC switch: DC

5.1.4. Auto/Norm switch: AUTO

5.1.5. Volts Full Scale switch: 1V

5.2.0. PROCEDURE

5.2.1. Select the 0-4V Multimeter voltage range.

5.2.2. Apply a 0.2 Hz square wave signal to the channel A (+) input BNC and adjust for a 3/4 full scale display.

5.2.3. Apply the same 0.2 Hz square wave signal to the multimeter.

5.2.4. Record both the (+) and (-) multimeter readings and ADD absolute values to obtain the peak-to-peak voltage.

5.2.5. Arm the Hold Next mode:
1. Hold in the Live button.
2. Tap the Hold button.
3. Release the Live button.

NOTE: Wait until the Live LED turns off (sweep completed) before proceeding.

5.2.6. Autocenter switch: ON

5.2.7. Vertical Expansion: Full clockwise position.

Several levels of data points appear on the screen due to "noise," (Figure 5-2).

5.2.8. Position the crosshair over the level containing the majority of data points, (Figure 5-3) by pressing the Left or Right Cursor button.

5.2.9. Press the Reset button.

The Time and Voltage Numerics indicate zero.

5.2.10. Using the Cursor button, position the crosshair over the opposite peak of the waveform.

5.2.11. Vertical Expansion: Full clockwise position.

5.2.12. Position the crosshair over the level containing the majority of data points by pressing the Left or Right Cursor button.

5.2.13. Record the peak-to-peak voltage displayed by the scope's voltage numerics.

5.2.14. Compute the Percent Error, (Equation 5-1).

5.2.15.

SPECIFICATION
Adjust the appropriate trim pot selected from (5.2.16) until the Percent Error is less than 0.2%.

5.2.16.

VOLTS FULL SCALE RANGE	TRIM POTS (See Figure 5-1)	
	Ch.A	Ch.B
1V	R57	R165

5.2.17. Live Button: Press

5.2.18. Vertical Expansion: OFF

5.2.19. Autocenter switch: OFF

5.2.20. Repeat Steps 5.2.1 through 5.2.19 until the percent error is less than 0.2%.

$$\text{Percent Error} = \left| \frac{\text{Multimeter (Vpp)} - \text{Scope (Vpp)}}{\text{Multimeter (Vpp)}} \right| \times 100$$

Equation 5-1

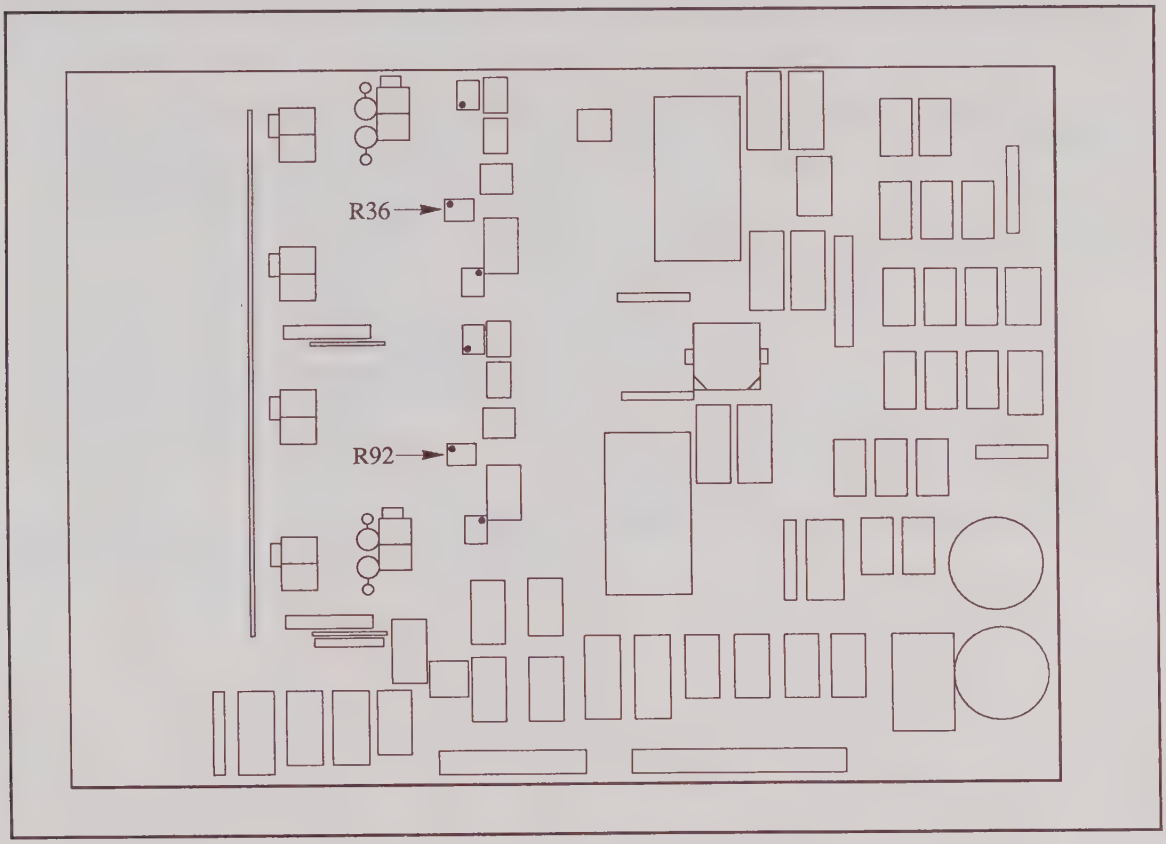


Figure 5-1: DC Gain Calibration for ADC without Mod Board Only.

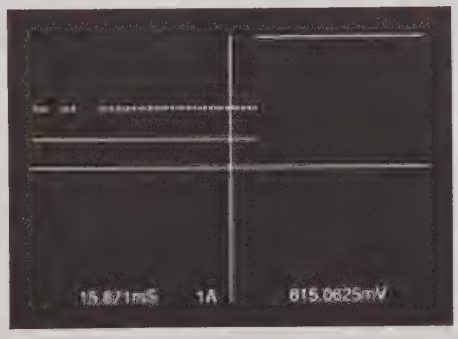


Figure 5-2

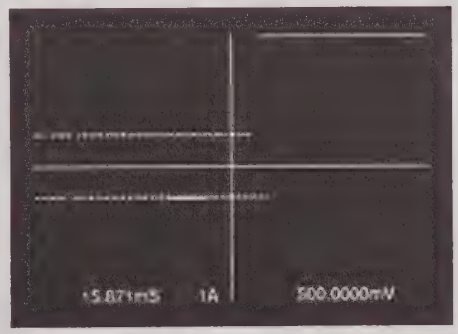


Figure 5-3

ADC without Mod Board Only

6.0.0. TIME BASE MEASUREMENT

NOTE: Use a Calibrated Digital Frequency Counter in this procedure.

6.1.0. SET-UP

6.1.1. Turn on the 310 and allow it to warm up.

6.2.0. PROCEDURE

NOTE: No adjustments are performed in this test.

6.2.1. Measure the frequency (Time Base) at U74, Pin 11 on the processor board. (See Figure 6-1).

6.2.2.

SPECIFICATION
The measured frequency should be no greater than 36.0036 MHz or less than 35.9964 MHz.

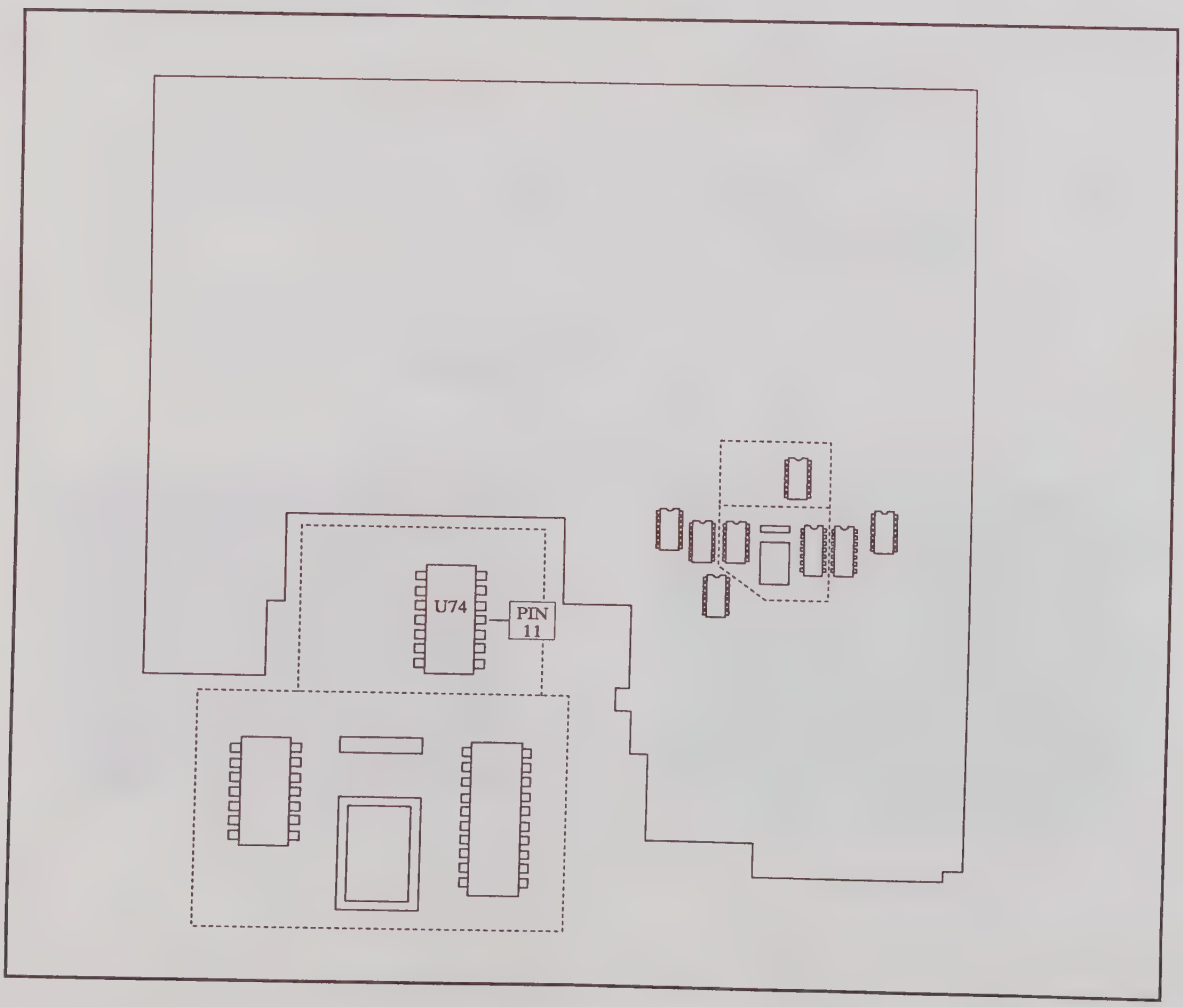


Figure 6-1

MNEMONICS FOR THE 310 BOARDS

ABBREVIATION	DEFINITION
(*)	Signal doesn't leave the board
adc	Analaog-to-Digital Converter bd
CRT	Cathode Ray Tube
Cur	Cursor board
F.P.	Front Panel Circuit Overview
I/O Board	I/O Board (Dual Drive System)
RS232	RS-232 connector
Tri	Trigger board
Pen	Pen outputs
Pro	Processor board

NOTE 1: The "-" sign at the end of a mnemonic identifies a "negated" command (e.g., RESET- = $\overline{\text{RESET}}$).

BOARD	PAGE
I/O Board	10-3
Processor Board	10-7
ADC (Including MOD) Board	10-11
ADC (Without MOD) Board	10-13
Trigger Board	10-15
Cursor Board	10-16

NOTE 2: Page references refer to the diagrams in Section 12 of this manual. If the reference page directs you to a diagram for a different ADC then found in the instrument you are servicing, please see page 10-13.

MNEMONIC	NAME	ORIGINATES	DESTINATION
00CE-	CRUin Enable	I/O Board (12-3)	I/O Board (12-3)
100CE-	Plotter UART Enable	I/O Board (12-3)	I/O Board (12-3)
180CE-	Test Port UART Enable	I/O Board (12-3)	I/O Board (12-3)
1 WAITSTATE	9995 Wait	I/O Board (12-3)	I/O Board (12-3)
20CLK-	CRUout Enable	I/O Board (12-3)	I/O Board (12-5)
1STOP/2STOP	Stop Bit	I/O Board (12-5)	I/O Board (12-5)
40CLK-	CRUout Enable	I/O Board (12-3)	I/O Board (12-3)
40EN-	Disk FP CRUin Enable	I/O Board (12-3)	I/O Board (12-5)
4 MHz	Beeper/GPIB Clock	I/O Board (12-9)	I/O Board (12-9)
50CLK-	CRUout Enable	I/O Board (12-3)	I/O Board (12-3)
50 EN-	Disk Control CRUin Enable	I/O Board (12-3)	I/O Board (12-11)
60 CLK-	CRUout Enable	I/O Board (12-3)	I/O Board (12-3)
60 EN-	I/O CRUin Enable	I/O Board (12-3)	I/O Board (12-5)
70 EN-	I/O CRUin Enable	I/O Board (12-3)	I/O Board (12-5)
75162SC	75162 System Control	I/O Board (12-3)	I/O Board (12-3)
80 CE-	Computer UART Enable	I/O Board (12-3)	I/O Board (12-3)
90 ADDR-	Memory Bus R/W Control	I/O Board (12-3)	I/O Board (12-7)
9995 DATABUS	995 Date Bus	I/O Board (12-3)	I/O Board (12-7 & 11)
A1 to A5	IEEE Address	I/O Board (12-5)	I/O Board (12-5)
BEEP-	Beeper Enable	I/O Board (12-5)	I/O Board (12-9)
BPS0 to BPS2	Set Baud Rate	I/O Board (12-5)	I/O Board (12-5)
CD0 to CD1	Command Delimiter	I/O Board (12-5)	I/O Board (12-5)
COMCTS-5	Computer Clear To Send	I/O Board (12-13)	I/O Board (12-11)
COMDTR-20	Computer Data Ready Terminal	I/O Board (12-11)	I/O Board (12-13)
COMRTS-4	Computer Request To Send	I/O Board (12-11)	I/O Board (12-13)
COMRX-3	Computer Receive Data	I/O Board (12-13)	I/O Board (12-11)
COMTX-2	Computer Transmit Data	I/O Board (12-11)	I/O Board (12-13)
CRUCLK	CRU Clock	I/O Board (12-3)	I/O Board (12-3 & 11)
CRUIN	CRU Data In	I/O Board (12-11)	I/O Board (12-3)
CRUOUT	9995 Serial Data	I/O Board (12-3)	I/O Board (12-3)
CRUOUTB	CRUout Buffered	I/O Board (12-3)	I/O Board (12-5 & 11)
DATA0 to DATA11	Memory Data Bus	I/O Board (12-7)	I/O Board (12-7)
DBIN	9995 Data Bus In	I/O Board (12-3)	I/O Board (12-11)
DBIN-	9995 Data Bus In	I/O Board (12-3)	I/O Board (12-11)
DFP-ACYCLE	Disk Autocycle Button	I/O Board (12-5)	I/O Board (12-7 & 9)
DFP-CENTER-DIG	Disk Center Digit Enable	I/O Board (12-5)	I/O Board (12-2)
DFP-COPY	Disk Copy Button	I/O Board (12-5)	I/O Board (12-5)
DFP-DN	Disk Down Button	I/O Board (12-5)	I/O Board (12-5)
DFP-FORMAT	Disk Format Button	I/O Board (12-5)	I/O Board (12-5)
DFP-LEDS	Disk Button LEDS Enable	I/O Board (12-5)	I/O Board (12-5)
DFP-LEFT-DIG	Disk Left Digit Enable	I/O Board (12-5)	I/O Board (12-5)
DFP-PLOT	Disk Plot Button	I/O Board (12-5)	I/O Board (12-5)
DFP-RECALL	Disk Recall Button	I/O Board (12-5)	I/O Board (12-5)
DFP-RIGHT-DIG	Disk Right Digit Enable	I/O Board (12-5)	I/O Board (12-5)
DFP-SEG-A	Disk Segment A	I/O Board (12-5)	I/O Board (12-5)
DFP-SEG-B	Disk Segment B	I/O Board (12-5)	I/O Board (12-5)
DFP-SEG-C	Disk Segment C	I/O Board (12-5)	I/O Board (12-5)

MNEMONIC	NAME	ORIGINATES	DESTINATION
DFP-SEG-D	Disk Segment D	I/O Board (12-5)	I/O Board (12-5)
DFP-SEG-DP	Disk Decimal Point	I/O Board (12-5)	I/O Board (12-5)
DFP-SEG-E	Disk Segment E	I/O Board (12-5)	I/O Board (12-5)
DFP-SEG-F	Disk Segment F	I/O Board (12-5)	I/O Board (12-5)
DFP-SEG-G	Disk Segment G	I/O Board (12-5)	I/O Board (12-5)
DFP-STORE	Disk Store Button	I/O Board (12-5)	I/O Board (12-5)
DFP-UNPROT	Disk Unprotect Button	I/O Board (12-5)	I/O Board (12-5)
DFP-UP	Disk Up Button	I/O Board (12-5)	I/O Board (12-5)
DIR-	Disk Head Direction	I/O Board (12-9)	I/O Board (12-9)
DS0-	Drive Select 0	I/O Board (12-9)	I/O Board (12-9)
DS1-	Drive Select 1	I/O Board (12-9)	I/O Board (12-9)
DS2-	Drive Select 2	I/O Board (12-9)	I/O Board (12-9)
DS3-	Drive Select 3	I/O Board (12-9)	I/O Board (12-9)
DSEN-	Drive Select Enable	I/O Board (12-5)	I/O Board (12-9)
ENTIMER-	UART Timer (1mS)	I/O Board (12-5)	I/O Board (12-7)
ENWAIT	Enable Waitstate	I/O Board (12-5)	I/O Board (12-7)
FDC&9914-	FDC/9914 Select Enable	I/O Board (12-3)	I/O Board (12-3)
FDC-	FDC Enable	I/O Board (12-3)	I/O Board (12-9)
FDC-DRATE	Disk Data Rate	I/O Board (12-5)	I/O Board (12-9)
FDC-INT	FDC Interrupt	I/O Board (12-9)	I/O Board (12-5)
FDC-RDY	Disk Ready	I/O Board (12-9)	I/O Board (12-5)
FDC-RST	FDC Reset	I/O Board (12-5)	I/O Board (12-9)
FDC-TC	FDC Terminal Count	I/O Board (12-5)	I/O Board (12-9)
FDC-WPROT	Diskette Write Protected	I/O Board (12-9)	I/O Board (12-5)
FP-RESET	Front Panel Reset	I/O Board (12-5)	I/O Board (12-3)
GPIBATN-11	GPIB Attention	I/O Board (12-11)	I/O Board (12-13)
GPIBD1-1	GPIB Data Bit 1	I/O Board (12-11)	I/O Board (12-13)
GPIBD2-2	GPIB Data Bit 2	I/O Board (12-11)	I/O Board (12-13)
GPIBD3-3	GPIB Data Bit 3	I/O Board (12-11)	I/O Board (12-13)
GPIBD4-4	GPIB Data Bit 4	I/O Board (12-11)	I/O Board (12-13)
GPIBD5-13	GPIB Data Bit 5	I/O Board (12-11)	I/O Board (12-13)
GPIBD6-14	GPIB Data Bit 6	I/O Board (12-11)	I/O Board (12-13)
GPIBD7-15	GPIB Data Bit 7	I/O Board (12-11)	I/O Board (12-13)
GPIBD8-16	GPIB Data Bit 8	I/O Board (12-11)	I/O Board (12-13)
GPIBDAV-6	GPIB Data Valid	I/O Board (12-11)	I/O Board (12-13)
GPIBEOI-5	GPIB End or Identify	I/O Board (12-11)	I/O Board (12-13)
GPIBIFC-9	GPIB Interface Clear	I/O Board (12-11)	I/O Board (12-13)
GPIBDAC-8	GPIB Not Data Accepted	I/O Board (12-11)	I/O Board (12-13)
GPIBNRFD-7	GPIB Not Ready For Data	I/O Board (12-11)	I/O Board (12-13)
GPIBREN-17	GPIB Remote Enable	I/O Board (12-11)	I/O Board (12-13)
GPIBSRQ-10	GPIB Service Request	I/O Board (12-11)	I/O Board (12-13)
INDEX-	Disk Index Pulse	I/O Board (12-9)	I/O Board (12-9)
INT-TPORT	Terminal Port Interrupt	I/O Board (12-11)	I/O Board (12-11)
IO-A0 to IO-A15	I/O Address Bus	I/O Board (12-3)	I/O Board (12-3)
IO-A12C to IO-A14C	A12 to A14 Buffered	I/O Board (12-3)	I/O Board (12-5 & 11)
IO-BREQ-	I/O Bus Request	I/O Board (12-7)	I/O Board (12-7)
IO-CLKOUT	I/O Clock 3 MHz	I/O Board (12-3)	I/O Board (12-3)
IO-CLKOUTB	I/O Clock Buffered	I/O Board (12-3)	I/O Board (12-7 & 9)

MNEMONIC	NAME	ORIGINATES	DESTINATION
IO-D0 to IO-D7	9995 Data Bus	I/O Board (12-3)	I/O Board (12-3, 7, 9 &11)
IO-DONE	I/O Done With Bus	I/O Board (12-7)	I/O Board (12-7)
IO-ENA-	I/O Has the Bus	I/O Board (12-7)	I/O Board (12-7)
IO-ENADR-	I/O Address to M Bus	I/O Board (12-7)	I/O Board (12-7)
IO-ENDATA-	I/O Data to Mem Data Bus	I/O Board (12-7)	I/O Board (12-7)
IO-INT1-	UART Interrupt	I/O Board (12-11)	I/O Board (12-3)
IO-INT4-	GPIB Interrupt	I/O Board (12-11)	I/O Board (12-3)
IO-NMI-	Non-Maskable Interrupt	I/O Board (12-5)	I/O Board (12-3)
IO-PROM-	EPROM Enable	I/O Board (12-3)	I/O Board (12-3)
IO-R/WL	Select Read/Write	I/O Board (12-7)	I/O Board (12-7)
IO-RSTB-	I/O Reset Buffered	I/O Board (12-3)	I/O Board (12-5)
IO-SRAM1-	I/O RAM Enable	I/O Board (12-3)	I/O Board (12-3)
LIVE	Live Button	I/O Board (12-11)	I/O Board (12-5)
LIVE-	Live Button	I/O Board (12-13)	I/O Board (12-11)
LIVESET	Software Live Button	I/O Board (12-5)	I/O Board (12-5)
LOW/HIGH	Plotter Resolution	I/O Board (12-5)	I/O Board (12-5)
M0 to M12	M Bus	I/O Board (12-7)	I/O Board (12-7)
MAP1	I/O Memory Map Change	I/O Board (12-5)	I/O Board (12-3)
MAP2	I/O Memory Map Change	I/O Board (12-5)	I/O Board (12-3)
MEMEN	I/O Memory Enable	I/O Board (12-3)	I/O Board (12-3)
MEMEN-	I/O Memory Enable	I/O Board (12-3)	I/O Board (12-3)
MOTORON-	Disk Motor On	I/O Board (12-9)	I/O Board (12-9)
ODD/EVEN	Parity	I/O Board (12-5)	I/O Board (12-5)
PARITY	Parity Enable	I/O Board (12-5)	I/O Board (12-5)
PLOTCTS-5	Plot Clear to Send	I/O Board (12-11)	I/O Board (12-13)
PLOTDSR-6	Plot Data Set Ready	I/O Board (12-13)	I/O Board (12-11)
PLOTRTS-4	Plot Request to Send	I/O Board (12-13)	I/O Board (12-11)
PLOTRX-3	Plot Receive Data	I/O Board (12-11)	I/O Board (12-13)
PLOTTX-2	Plot Transmit Data	I/O Board (12-13)	I/O Board (12-11)
RAS-	Row Address Select	I/O Board (12-7)	I/O Board (12-7)
RDATA-	Data From Disk	I/O Board (12-9)	I/O Board (12-9)
RDY-9995	9995 Ready	I/O Board (12-7)	I/O Board (12-3)
READ	I/O Read from 310 Memory	I/O Board (12-7)	I/O Board (12-7)
READY-	Disk Ready	I/O Board (12-9)	I/O Board (12-9)
RESET-	I/O Reset	I/O Board (12-3)	I/O Board (12-3)
RET5	Front Panel Return 5	I/O Board (12-5)	I/O Board (12-13)
RET6	Front Panel Return 6	I/O Board (12-5)	I/O Board (12-13)
RS232/GPIB	RS232/GPIB Select	I/O Board (12-5)	I/O Board (12-5)
RS232GPIB-PLOT	Plotter Select	I/O Board (12-5)	I/O Board (12-5)
SIDE1-	Select Side 1 of Disk	I/O Board (12-9)	I/O Board (12-9)
STEP-	Move Disk Head	I/O Board (12-9)	I/O Board (12-9)
STORE	Store Button	I/O Board (12-11)	I/O Board (12-5)
STORE-	Store Button	I/O Board (12-13)	I/O Board (12-11)
STORESET	Software Store Button	I/O Board (12-5)	I/O Board (12-5)
TERMCD-8	Terminal Carrier Detected	I/O Board (12-13)	I/O Board (12-11)
TERMCTS-5	Terminal Clear to Send	I/O Board (12-11)	I/O Board (12-13)
TERMDSR-6	Terminal Data Set Ready	I/O Board (12-13)	I/O Board (12-11)
TERMRTS-4	Terminal Request to Send	I/O Board (12-13)	I/O Board (12-11)

MNEMONIC	NAME	ORIGINATES	DESTINATION
TERMRX-3	Terminal Receive Data	I/O Board (12-11)	I/O Board (12-13)
TERMTX-2	Terminal Transmit Data	I/O Board (12-13)	I/O Board (12-11)
TIME-	Time/Point Enable	I/O Board (12-13)	I/O Board (12-5)
TLED-A	Test LED Segment A	I/O Board (12-5)	I/O Board (12-5)
TLED-B	Test LED Segment B	I/O Board (12-5)	I/O Board (12-5)
TLED-C	Test LED Segment C	I/O Board (12-5)	I/O Board (12-5)
TLED-D	Test LED Segment D	I/O Board (12-5)	I/O Board (12-5)
TLED-DP	Test LED Decimal Point	I/O Board (12-3)	I/O Board (12-5)
TLED-E	Test LED Segment E	I/O Board (12-5)	I/O Board (12-5)
TLED-F	Test LED Segment F	I/O Board (12-5)	I/O Board (12-5)
TLED-G	Test LED Segment G	I/O Board (12-5)	I/O Board (12-5)
TMS9914-	GPIB Enable	I/O Board (12-3)	I/O Board (12-11)
MEM SYNC	Starts Memory Cycle	I/O Board (12-7)	I/O Board (12-7)
TRK00-	Disk Head at Track 0	I/O Board (12-9)	I/O Board (12-9
US0	Disk Select Address	I/O Board (12-5)	I/O Board (12-9)
US1	Disk Select Address	I/O Board (12-5)	I/O Board (12-9)
WDATA-	Data to Disk	I/O Board (12-9)	I/O Board (12-9)
WE-	I/O Write Enable	I/O Board (12-3)	I/O Board (12-3, 7, 9& 11)
WGATE-	Write Enable to Disk	I/O Board (12-9)	I/O Board (12-9)
WPROT-	Write Protect From Disk	I/O Board (12-9)	I/O Board (12-9)
WRPULSE	I/O Write to 310 Memory	I/O Board (12-7)	I/O Board (12-7)

MNEMONIC	NAME	ORIGINATES	DESTINATION
+5	+5V	Pro (12-25)	adc, rc
+5V	+5V	ps (12-3)	Pro, adc
+12	+12V	Pro (12-19)	adc
+12C	-12V	adc (12-27)	Pro
+15	+15V	Pro (12-25)	adc
+15V	+15V	ps (12-3)	Pro, adc
+170	+170V	Pro (12-25)	*
-5V	-5V	ps (12-3)	Pro, adc
-12	-12V	Pro (12-19)	adc
-12C	-12V	adc (12-27)	Pro
-15	-15V	Pro (12-25)	adc
-15V	-15V	ps (12-3)	Pro, adc
1MHZ	1 Mega Hertz	Pro (12-23)	adc
1MHZ-	1 Mega Hertz-	Pro (12-23)	adc
2MHZ	2 Mega Hertz	Pro (12-23)	adc
2MHZ-	2 Mega Hertz-	Pro (12-23)	adc
9M/50	9 MHz/50% Duty Cycle	Pro (12-23)	*
9M/75	9 Mhz/75% Duty Cycle	Pro (12-23)	*
36MHz	36 MHz Clock	Pro (12-23)	*
A INT	Channel A Internal	adc (12-27)	Pro
A/B-	Channel A/Channel B-	Pro (12-23)	adc
A0 - A3	Register A Address	Pro (12-19)	*
A13	Address 13	Pro (12-21)	*
ABUS	2901 A Port Address	Pro (12-21)	*
ADCSH	ADC Sample & Hold Clock	Pro (12-23)	adc
B INT	Channel B Internal Clock	adc (12-27)	Pro
B0 - B3	Register B Address	Pro (12-19)	*
B0 - B7	Microprocessor Bus	Pro (12-19)	adc
B8 through B15	Microprocessor Bus	Pro (13-7)	adc
BC0 - BC2	Bus Control Address	Pro (12-19)	*
BEAM	Blanking	Pro (12-19)	*
BLKG	Blanking Signal	Pro (12-25)	*
BLOCKWE-	Block Write Enable-	adc (12-29)	Pro
BLOCKWE-	Memory Write Inhibit	Pro (12-21)	*
BUSS	2901 B Port Address	Pro (12-19)	*
C2 - C6	ADC Clock 2-6	Pro (12-23)	adc
CAL	Pen Calibrate	Pro (12-19)	*
CAS'	Column Address Select	Pro (12-23)	*
CAS-	Column Strobe Address-	Pro (12-23)	*
CD	Carrier Detect	Pro (12-21)	RS232
CHA MEM	Channel A Memory	Pro (12-23)	adc
CHAMEM	ChA. Memory	Pro (12-23)	adc
CHAR-	Character-	Pro (12-19)	*
CHB MEM	Channel B Memory	Pro (12-23)	adc
CHBMEM	ChB. Memory	Pro (12-23)	adc
CLEAR CYCLE	Clear Cycle	Pro (12-23)	*
CPU MEM	CPU Memory	Pro (12-23)	adc

MNEMONIC	NAME	ORIGINATES	DESTINATION
CPU MEM-	CPU Memory-	Pro (12-23)	*
CPUMEM	CPU Memory Cycle	Pro (12-21)	*
CPUMEM-	CPU Memory Cycle	Pro (12-21)	*
CTS-	Clear To Send	Pro (12-21)	RS232
CUREN-	Cursor Enable Line	Pro (12-19)	*
D0 through D11	Data	adc (12-27)	Pro
D0-D15	2901 Data Bus	Pro (12-21)	*
DATA 0 - DATA 11	DC Data Bus	Pro (12-21)	adc
DATA PL-	ADC Data Enable-	Pro (12-23)	adc
DBUS	2901 Data Bus	Pro (12-21)	*
DISPROM-	Disable Proms	Pro (12-19)	*
DRAM-	Dynamic RAM Enable-	Pro (12-19)	*
DSR	Data Set Ready	Pro (12-21)	*
DTR	Data Terminal Ready	Pro (12-21)	RS232
DWELL-	Dwell-	adc (12-29)	Pro
EXT CAS	Pits Control CAS	Pro (12-23)	*
EXT COUNT	Pits Control Counter	Pro (12-23)	*
EXT EN-	Enable Pits Control Lines	Pro (12-23)	*
EXT RAS	Pits Control RAS	Pro (12-23)	*
EXT REFEN-	Pits Control Refresh	Pro (12-23)	*
FESH	Front End Sample & Hold	Pro (12-23)	adc
FP-	Front Panel-	Pro (12-19)	*
FUNNUMEN-	Function/Numerics Enable	Pro (12-19)	*
G1	Control Grid Voltage	Pro (12-25)	CRT
G2	Fixed Voltage	Pro (12-25)	CRT
H1	Heater Voltage	Pro (12-25)	CRT
H2	Heater Voltage	Pro (12-25)	CRT
HEXEN-	Hex Enable Line	Pro (12-19)	*
HKL	Horizontal Cursor Load	Pro (12-19)	adc
I/O LED-	I/O Enable-	Pro (12-21)	Cursor
I/OEN-	I/O Enable Line	Pro (12-21)	*
I/OENA-	I/O R/W	Pro (12-21)	*
I2 - I6	Instruction Word	Pro (12-19)	*
IA0 - IA11	Instruction Address Bus	Pro (12-19)	*
IABUS	PROM Address Bus	Pro (12-19)	*
IND EN	Enable K Bus	Pro (12-19)	*
J2	Jump 2	Pro (12-19)	*
K	Intensity Voltage	Pro (13-11)	CRT
K0 - K11	Constant Field	Pro (12-19)	*
KBUS	Constant/Jump Address	Pro (12-19)	*
KE-	Constant Enable-	Pro (12-19)	*
LDMB	Load Memory Bus	Pro (12-19)	*
LIVE-	Live Mode-	Pro (12-21)	adc, rc
LIVEB-	Live to I/O Board	Pro (12-21)	*
LOP	Load Output	Pro (12-19)	*
M-	Memory Enable-	Pro (12-19)	*
M0 - M15	Memory Address Bus	Pro (12-21)	adc

MNEMONIC	NAME	ORIGINATES		DESTINATION
MBUS	Memory Bus	Pro	(12-19)	*
MBUSY	Microprocessor Busy	Pro	(12-23)	*
MH ADC	Memory Half ADC	Pro	(12-21)	*
MH µp	Memory Half Microprocessor	Pro	(12-21)	*
MWR	Memory Write	Pro	(12-19)	*
NEG	2901 Negative Flag	Pro	(12-19)	*
OVR	2901 Overflow Flag	Pro	(12-19)	*
P BEAM	Program Beam	Pro	(12-19)	*
P LIFT	Pen Lift	Pro	(12-19)	Pen
P1	Focus Voltage	Pro	(12-25)	CRT
P2	Astigmatism Voltage	Pro	(12-19)	CRT
PBEAM	Blanking Signal From PROM	Pro	(12-19)	*
PDA	Anode High Voltage	Pro	(12-25)	CRT
PEN CLAMP	Pen Clamp	Pro	(12-21)	*
PEN LIFT	Pen Lift	Pro	(12-21)	*
PENSPD1	Rack Mount Penspeed	Pro	(12-19)	*
PENSPD2	Rack Mount Penspeed	Pro	(12-19)	*
PLIFT	Pen Lift Output	Pro	(12-19)	*
Q1M	Delay 1 MHz	Pro	(12-23)	*
RAS'	Row Address Select	Pro	(12-23)	*
RAS-	Row Address Stable-	Pro	(12-23)	*
RDATA	Read Data	Pro	(12-21)	RS232
READ	I/O Read	Pro	(12-21)	*
REFCYC	Refresh Cycle	Pro	(12-23)	*
REFCYC-	Refresh Cycle	Pro	(12-21)	*
REFEN	Reference	Pro	(12-23)	*
REFEN-	Reference-	Pro	(12-23)	*
REFRESH-	Refresh-	Pro	(12-21)	*
RESET-	Pits Control System Reset	Pro	(12-19)	*
RET 0-RET 7	Front Panel Return Lines	Pro	(12-19)	*
ROW EN	Row Enable	Pro	(12-23)	*
RS DATA OUT	RS232 Data OUT	Pro	(12-21)	*
RS232 EN-	RS232 Enable-	Pro	(12-21)	Cur, Pro
RS232-CTS	Clear To Send	Pro	(12-21)	*
RS DATA OUT	RS232 Data Output	Pro	(12-21)	*
RTM	Real Time	Pro	(12-21)	*
RTS	Request To Send	Pro	(12-21)	RS232
SA-	Scratch Address Enable-	Pro	(12-19)	*
SA1 - SA12	Scratch Address Bus	Pro	(12-21)	Pro
SDWELL-	Sweep Dwell-	Pro	(12-23)	adc
STORE-	Store Mode-	Pro	(12-21)	adc, rc
STOREB-	Store to I/O	Pro	(12-21)	*
SWP DONE	Sweep Done	adc	(12-29)	Cur, Pro
T9M/50	Terminated 9M/50	Pro	(12-19)	*
T9M/75	Terminated 9M/75	Pro	(12-19)	*
TDATA	Transmitted Data	Pro	(12-21)	RS-232
THD	To Horizontal Dac	Pro	(12-19)	*

MNEMONIC	NAME	ORIGINATES	DESTINATION
TIME-	Time/Point Enable Line	Pro (12-19)	*
TRIG	Trigger	Pro (12-21)	adc
TRIG-	Trigger-	adc (12-29)	Pro
TSWP1-	Triggered Sweep 1-	adc (12-29)	Pro
TVD	To Vertical Dac	Pro (12-19)	*
VEX EN-	Vertical Expansion-	F.P (12-40)	Pro, Cur
WE	Write Enable	Pro (12-23)	*
WR-	Memory Write	Pro (12-21)	*
WRPULSE	I/O Write	Pro (12-21)	*
X PEN	X Pen	Pro (12-19)	Pen
X+	Deflection Voltage	Pro (12-25)	CRT
X-	Deflection Voltage	Pro (12-25)	CRT
Y PEN	Y Pen	Pro (12-19)	Pen
Y+	Deflection Voltage	Pro (12-25)	CRT
Y-	Deflection Voltage	Pro (12-25)	CRT
Y PEN	Vertical Pen Out	Pro (12-19)	*
ZERO	2901 Zero Flag	Pro (12-19)	*
µPWR	Microprocessor Power	Pro (12-23)	*
µPWR-	Microprocessor Power-	Pro (12-23)	*

MNEMONIC	NAME	ORIGINATES	DESTINATION
+5	+5	Pro (12-25)	adc*, rc
+5F	+5V	adc* (12-27)	*
+5V	+5V	ps (12-3)	Pro, adc*
+12	+12V	Pro (12-19)	adc*
+12A(B)	+12V	adc* (12-27)	*
+12C	+12V	adc* (12-27)	Pro
+15	+15V	Pro (12-25)	adc*
+15V	+15V	ps (12-3)	Pro, adc*
+Vm	+ Bias Voltage	adc* (12-27)	*
-5F	-5V	adc* (12-27)	*
-5V	-5V	ps (12-3)	Pro, adc*
-12	-12V	Pro (12-19)	adc*
-12A(B)	-12V	adc* (12-27)	*
-12C	-12V	adc* (12-27)	Pro
-15	-15V	Pro (12-25)	adc*
-15V	-15V	ps (12-3)	Pro, adc*
-Vb	- Bias Voltage	adc* (12-27)	*
1MHZ	1 Mega Hertz	Pro (12-23)	adc*
1MHZ-	1 Mega Hertz	Pro (12-23)	adc*
2MD3	Synched Delay 3	adc* (12-29)	*
2MHZ	2 Mega Hertz	Pro (12-23)	adc*
2MHZ-	2 Mega Hertz	Pro (12-23)	adc*
A 1MHZ	Channel A 1 Mega Hertz	adc* (12-29)	*
A 1MHZ-	Channel A 1 Mega Hertz-	adc* (12-29)	*
A 2MHZ	Channel A 2 Mega Hertz	adc* (12-29)	*
A 2MHZ-	Channel A 2 Mega Hertz-	adc* (12-29)	*
A INT	Channel A Internal	adc* (12-27)	Pro
A TRIG	Channel A Trigger	Tri (12-35)	adc*
A+	Channel A (+) Signal	Tri (12-35)	adc*
A-	Channel A (-) Signal	Tri (13-19)	adc*
A/B-	Channel A/Channel B-	Pro (12-23)	adc*
ADCSH	ADC Sample & Hold Clock	Pro (13-9)	adc*
AOFF-	Channel A Off-	adc* (12-29)	*
AOUT (BOUT)	Channel A, Channel B Out	adc* (12-27)	*
ASR-	Channel A Save Reference-	adc* (12-29)	*
B INT	Channel B Internal Clock	adc* (12-27)	Pro
B+	Channel B (+) Signal	Tri (12-35)	adc*
B-	Channel B (-) Signal	Tri (12-35)	adc*
B0 through B7	Microprocessor Bus	Pro (12-19)	adc*
B2MHZ	Channel B 2 Mega Hertz	adc* (12-27)	*
B8 through B15	Microprocessor Bus	Pro (12-21)	adc*
BC2 thru BC6	Buffered Clock	adc* (12-27)	*
BDATAPL-	Buffered Datapl-	adc* (12-27)	*
BLOCKWE-	Block Write Enable-	adc* (12-29)	Pro
BOFF-	Channel B Off-	adc* (12-29)	*
BOUT	Channel B Out	adc* (12-27)	*
BSR-	Channel B Save Reference-	adc* (12-29)	*

* Refers to ADC Board including MOD Board.

MNEMONIC	NAME	ORIGINATES	DESTINATION
C2 - C6	ADC Clock 2-6	Pro (12-23)	adc*
CHA MEM	Channel A Memory	Pro (12-23)	adc*
CHA-	Channel A-	Tri (12-35)	adc*
CHB MEM	Channel B Memory	Pro (12-23)	adc*
CHB-	Channel B-	Tri (12-35)	adc*
CPU MEM	CPU Memory	Pro (12-23)	adc*
CRY	Carry	adc* (12-29)	*
CURSOR	Cursor	Tri (12-35)	Pro, adc*
D SWP1-	Delayed Sweep 1-	adc* (12-29)	*
D0 thru D11	Data	adc* (12-27)	Pro
DATA PL-	ADC Data Enable-	Pro (12-23)	adc*
DWELL-	Dwell-	adc* (12-29)	Pro
FESH	Front End Sample & Hold	Pro (12-23)	adc*
HEX EN-	Horizontal Expansion-	adc* (12-27)	Pro, adc*
HKL	Horizontal Cursor Load	Pro (12-19)	adc*
LIVE LED-	Live LED-	adc* (12-27)	Tri
LIVE-	Live Mode-	Pro (12-21)	adc*, rc
LOAD	Load	adc* (12-29)	*
LOAD-	LOAD-	adc* (12-29)	*
M0 - M15	Memory Address Bus	Pro (12-21)	adc*
PCURSOR-	Program Cursor-	adc* (12-29)	*
RET0 - RET7	Front Panel Return Lines	F.P. (12-40)	adc*, Cur, Proc
SDWELL-	Sweep Dwell-	Pro (12-23)	adc*
ST SWP1-	Start Sweep 1-	adc* (12-29)	*
STORE LED-	Store Led-	adc* (12-29)	Tri
STORE-	Store Mode-	Pro (12-21)	adc*, rc
SWP DONE	Sweep Done	adc* (12-29)	Cur, Pro
SWP1	Sweep One	adc* (12-29)	*
SWP1-	Sweep One-	adc* (12-27)	*
TRIG LED-	Trigger LED-	adc* (12-29)	Tri
TRIG	Trigger	Pro (12-21)	adc*
TRIG-	Trigger-	adc* (12-29)	Pro
TSWP1-	Triggered Sweep	adc* (12-29)	Pro
U/D-	Up/Down-	adc* (12-29)	*
XA CRY	X Address Carry	adc* (12-29)	*
XA0 - XA11	X Address Bus	adc* (12-29)	*
XADCSH	Buffered ADCSH	adc* (12-27)	*
XHKL-	Buffered HKL-	adc* (12-29)	*

* Refers to ADC Board including MOD Board.

MNEMONIC	NAME	ORIGINATES	DESTINATION
+5	+5	Pro (12-25)	adc*, rc
+5F	+5V	adc* (12-51)	*
+5V	+5V	ps (12-3)	Pro, adc*
+12	+12V	Pro (12-19)	adc*
+12A(B)	+12V	27)	*
+12C	+12V	adc* (12-47,49)	Pro
+15	+15V	Pro (12-25)	adc*
+15V	+15V	ps (12-3)	Pro, adc*
-5V	-5V	adc* (12-51, 53)	*
-5V	-5V	ps (12-3)	Pro, adc*
-12	-12V	Pro (12-19)	adc*
-12A(B)	-12V	adc* (12-43-49)	*
-12C	-12V	adc* (12-59)	Pro
-15	-15V	Pro (12-25)	adc*
-15V	-15V	ps (12-3)	Pro, adc*
1MHZ	1 Mega Hertz	Pro (12-23)	adc*
1MHZ-	1 Mega Hertz	Pro (12-23)	adc*
2MD3	Synched Delay 3	adc* (12-53, 55)	*
2MHZ	2 Mega Hertz	Pro (12-23)	adc*
2MHZ-	2 Mega Hertz	Pro (12-23)	adc*
A TRIG	Channel A Trigger	Tri (12-35)	adc*
A+	Channel A (+) Signal	Tri (12-35)	adc*
A-	Channel A (-) Signal	Tri (13-19)	adc*
A/B-	Channel A/Channel B-	Pro (12-23)	adc*
A1MHZ	Channel A 1 Mega Hertz	adc* (12-55)	*
A1MHZ-	Channel A 1 Mega Hertz-	adc* (12-55)	*
A2MHZ	Channel A 2 Mega Hertz	adc* (12-55)	*
A2MHZ-	Channel A 2 Mega Hertz-	adc* (12-55)	*
ADCSH	ADC Sample & Hold Clock	Pro (13-9)	adc*
AINT	Channel A Internal	adc* (12-47)	Pro
AOFF- (BOFF-)	Channel A Off-	adc* (12-57)	*
AOUT (BOUT)	Channel A, Channel B Out	adc* (12-47, 49)	*
ASDWELL-	Dwell-	adc* (12-55)	Pro
ASR-	Channel A Save Reference-	adc* (12-57)	*
B+	Channel B (+) Signal	Tri (12-35)	adc*
B-	Channel B (-) Signal	Tri (12-35)	adc*
B0 through B7	Microprocessor Bus	Pro (12-19)	adc*
B2MHZ	Channel B 2 Mega Hertz	adc* (12-55)	*
B8 through B15	Microprocessor Bus	Pro (12-21)	adc*
BINT	Channel B Internal Clock	adc* (12-49)	Pro
BLOCKWE-	Block Write Enable-	adc* (12-53)	Pro
BOFF-	Channel B Off-	adc* (12-57)	*
BOUT	Channel B Out	adc* (12-49)	*
C2 - C6	ADC Clock 2-6	Pro (12-23)	adc*
CHA MEM	Channel A Memory	Pro (12-23)	adc*
CHA-	Channel A-	Tri (12-35)	adc*
CHB MEM	Channel B Memory	Pro (12-23)	adc*

* Refers to ADC Board without MOD Board.

MNEMONIC	NAME	ORIGINATES	DESTINATION
CHB-	Channel B-	Tri (12-35)	adc*
CPU MEM	CPU Memory	Pro (12-23)	adc*
CRY	Carry	adc* (12-53)	*
CURSOR	Cursor	Tri (12-35)	Pro, adc*
DATA PL-	ADC Data Enable-	Pro (12-23)	adc*
DATA0 - DATA11	Data	adc* (12-51)	Pro
DSWP1-	Delayed Sweep 1-	adc* (12-55)	*
DWELL-	Dwell-	adc* (12-55)	Pro
FESH	Front End Sample & Hold	Pro (12-23)	adc*
HEXEN-	Horizontal Expansion-	adc* (12-57)	Pro, adc*
HKL	Buffered HKL	adc* (12-53	*
HKL	Horizontal Cursor Load	Pro (12-19)	adc*
LIVE LED-	Live LED-	adc* (12-55)	Tri
LIVE-	Live Mode-	Pro (12-21)	adc*, rc
LOAD	Load	adc* (12-53)	*
M0 - M15	Memory Address Bus	Pro (12-21)	adc*
PCURSOR-	Program Cursor-	adc* (12-55)	*
RET0 - RET7	Front Panel Return Lines	F.P. (12-40)	adc*, Cur, Proc
SDWELL-	Sweep Dwell-	Pro (12-23)	adc*
ST SWP1-	Start Sweep 1-	adc* (12-53)	*
STORE LED-	Store Led-	adc* (12-55)	Tri
STORE-	Store Mode-	Pro (12-21)	adc*, rc
SWP1	Sweep One	adc* (12-53)	*
SWP1-	Sweep One-	adc* (12-53)	*
SWPDONE	Sweep Done	adc* (12-55)	Cur, Pro
TRIG LED-	Trigger LED-	adc* (12-55)	Tri
TRIG	Trigger	Pro (12-21)	adc*
TRIG-	Trigger-	adc* (12-55)	Pro
TSWP1-	Triggered Sweep	adc* (12-53)	Pro
U/D-	Up/Down-	adc* (12-53)	*
XA CRY	X Address Carry	adc* (12-53)	*
XA0 - XA11	X Address Bus	adc* (12-53)	*

* Refers to ADC Board without MOD Board.

MNEMONIC	NAME	ORIGINATES	DESTINATION
A+	Channel A (+) Signal	Tri (12-35)	adc
A-	Channel A (-) Signal	Tri (12-35)	adc
A TRIG	Channel A Trigger	Tri (12-35)	adc
B+	Channel B (+) Signal	Tri (12-35)	adc
B-	Channel B (-) Signal	Tri (12-35)	adc
CHA-	Channel A-	Tri (12-35)	adc
CHB-	Channel B-	Tri (12-35)	adc
CURSOR	Cursor	Tri (12-35)	Pro, adc
LIVE LED-	Live LED-	adc (12-29)	Tri
STORE LED-	Store Led-	adc (12-29)	Tri
TRIG LED-	Trigger LED-	adc (12-27)	Tri

MNEMONIC	NAME	ORIGINATES	DESTINATION
I/O LED-	I/O LED-	Pro (12-21)	Cursor
RESET	Reset	Pro (12-21)	Cursor, adc, Proc
RS232 EN-	RS232 Enable-	Pro (12-21)	Cur, Proc
SWP DONE	Sweep Done	adc (12-29)	Cur, Pro
VEX EN-	Vertical Expansion-	F.P. (12-39)	Cur, Pro

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*ADC Including Mod Board
**ADC without Mod Board

PARTS LIST SAMPLE

Major Assembly Description

310 RACK MOUNT OPTION

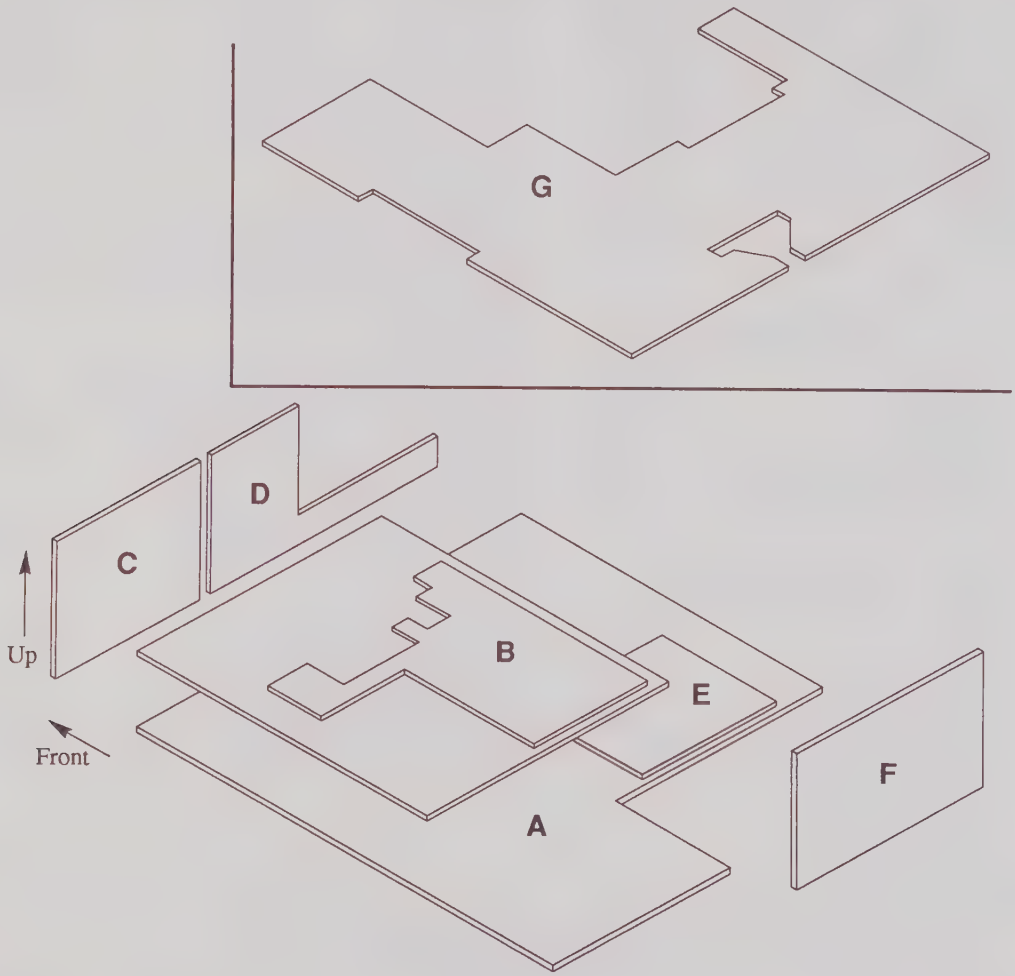
RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
•1	617-933400	**310 PROCESSOR ASSEMBLY**	1.000
••2	407-002102	**CBL/310 CRT 13 COND**	1.000
•••3	085-715801	CBL/12 COND CRT SPECIAL BUY	1.000

Subassembly Description

Design REVISION level.

PRINTED CIRCUIT BOARD Part Number, listed on diagrams & etched on the board.

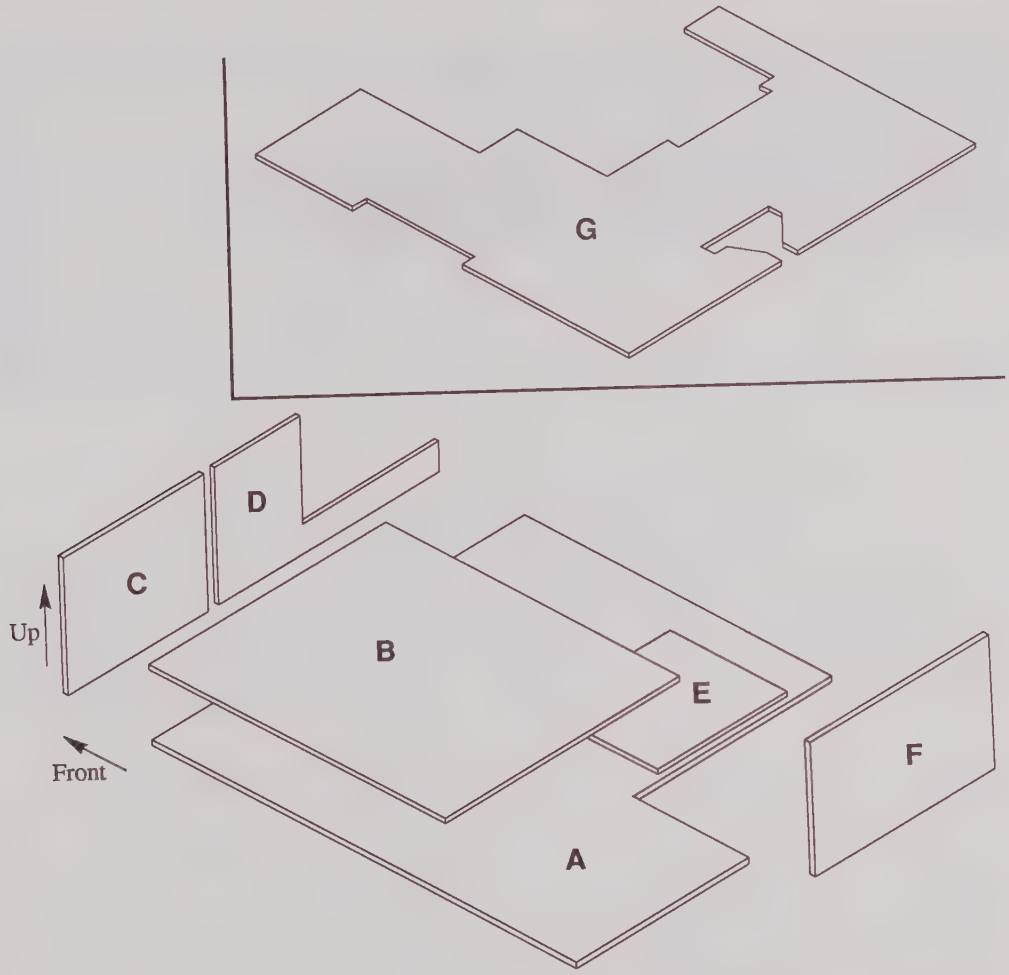
310 PRINTED CIRCUIT BOARDS, ADC INCLUDING MOD BOARD



ITEM	PRINTED CIRCUIT BOARDS	PART NUMBERS		DIAGRAMS
		Major Assembly	Components	
A	Processor Board	617-933400	11-15	12-19
B	ADC Board*	617-935501	11-39	12-27
C	Trigger Board	617-000300	11-23	12-35
D	Cursor Board	417-939400	11-19	12-37
E	High Voltage Blanking Board	(Part of Processor)	11-15	12-25
F	Power Supply	113-716100	11-38	12-3
G	I/O Board	617-937000	11-28	12-5

* ADC Board including Mod Board.

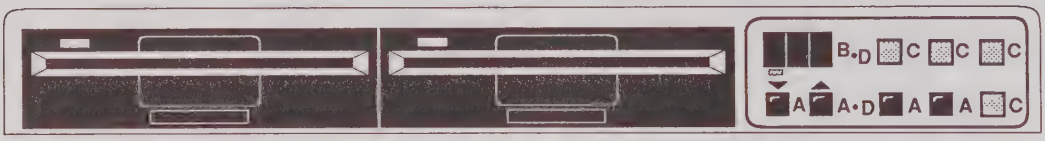
310 PRINTED CIRCUIT BOARDS, ADC WITHOUT MOD BOARD



ITEM	PRINTED CIRCUIT BOARDS	PART NUMBERS		DIAGRAMS
		Major Assembly	Components	
A	Processor Board	617-933400	11-15	12-19
B	ADC Board**	617-941301	11-20	12-27
C	Trigger Board	617-000300	11-23	12-35
D	Cursor Board	417-939400	11-19	12-37
E	High Voltage Blanking Board	(Part of Processor)	11-15	12-25
F	Power Supply	113-716100	11-38	12-3
G	I/O Board	617-937000	11-28	12-5

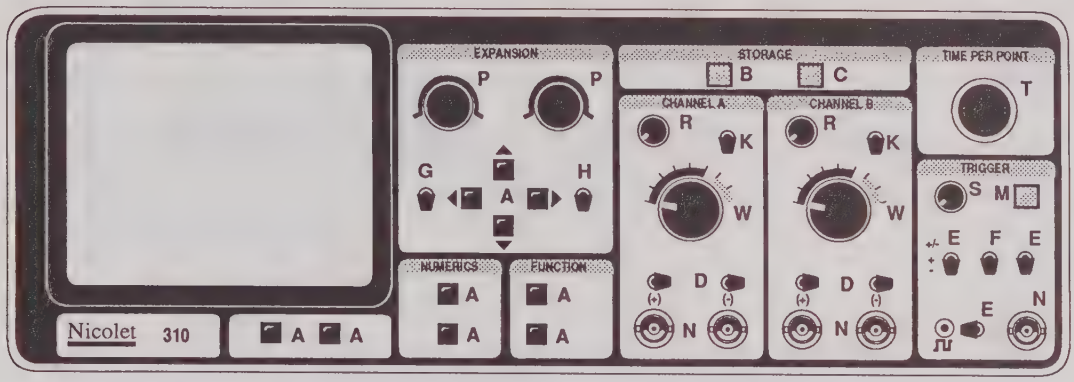
** ADC Board without Mod Board.

310 I/O PENTHOUSE FRONT PANEL CONTROLS



310 I/O PENTHOUSE FRONT PANEL CONTROL PART NUMBERS					
Item	**Description**	**Part Number**	**Item**	**Description**	**Part Number**
A	Pushbutton (Black)	025-739200	C	Pushbutton (Smoke)	025-748500
B	7-Segment Display	163-703000	D	Recessed Switch	025-739600

310 FRONT PANEL CONTROLS



310 FRONT PANEL CONTROL PART NUMBERS

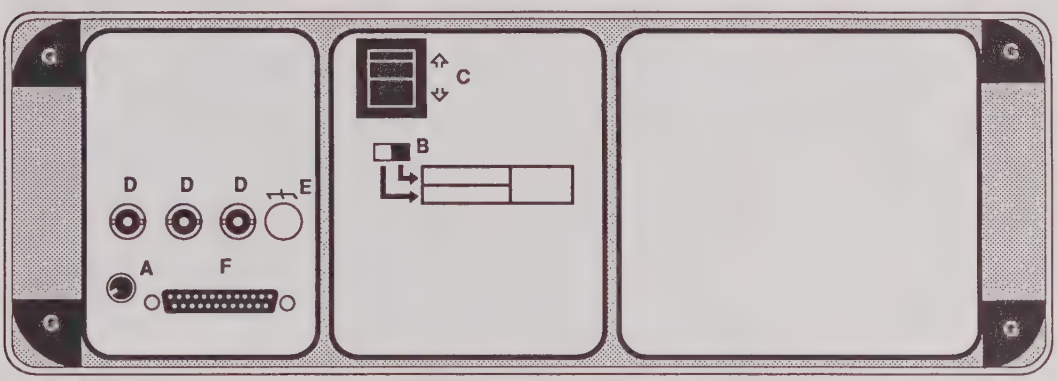
Item	Description	Part Number
A	Pushbutton (Black)	025-739200
B	Pushbutton (Green)	025-746200
C	Pushbutton (Red)	025-746100
D	Switch (Toggle)	025-746700
	Knob	035-704800
E	Switch (Toggle)	025-743300
	Knob	035-704800
F	Switch (Toggle)	025-743200
	Knob	035-704800
G	Switch (Toggle)	025-745900
	Knob	035-704800
H	Switch (Toggle)	025-745800
	Knob	035-704800
K	Switch (Toggle)	025-744600
	Knob	035-704800
M	Pushbutton (Green)	025-746000
N	Input BNC	024-721400
P	Switch (Rotary)	025-744800
	Knob	045-712100
R	Potentiometer	026-715500
	Knob	045-712200
S	Potentiometer	026-716600
	Knob	045-712200
T	Switch (Rotary)	025-744800
	Knob	045-712300
W	Switch (Rotary)	025-745700
	Knob	045-712300

310 I/O PENTHOUSE REAR PANEL CONTROLS

310 I/O PENTHOUSE REAR PANEL CONTROL PART NUMBERS

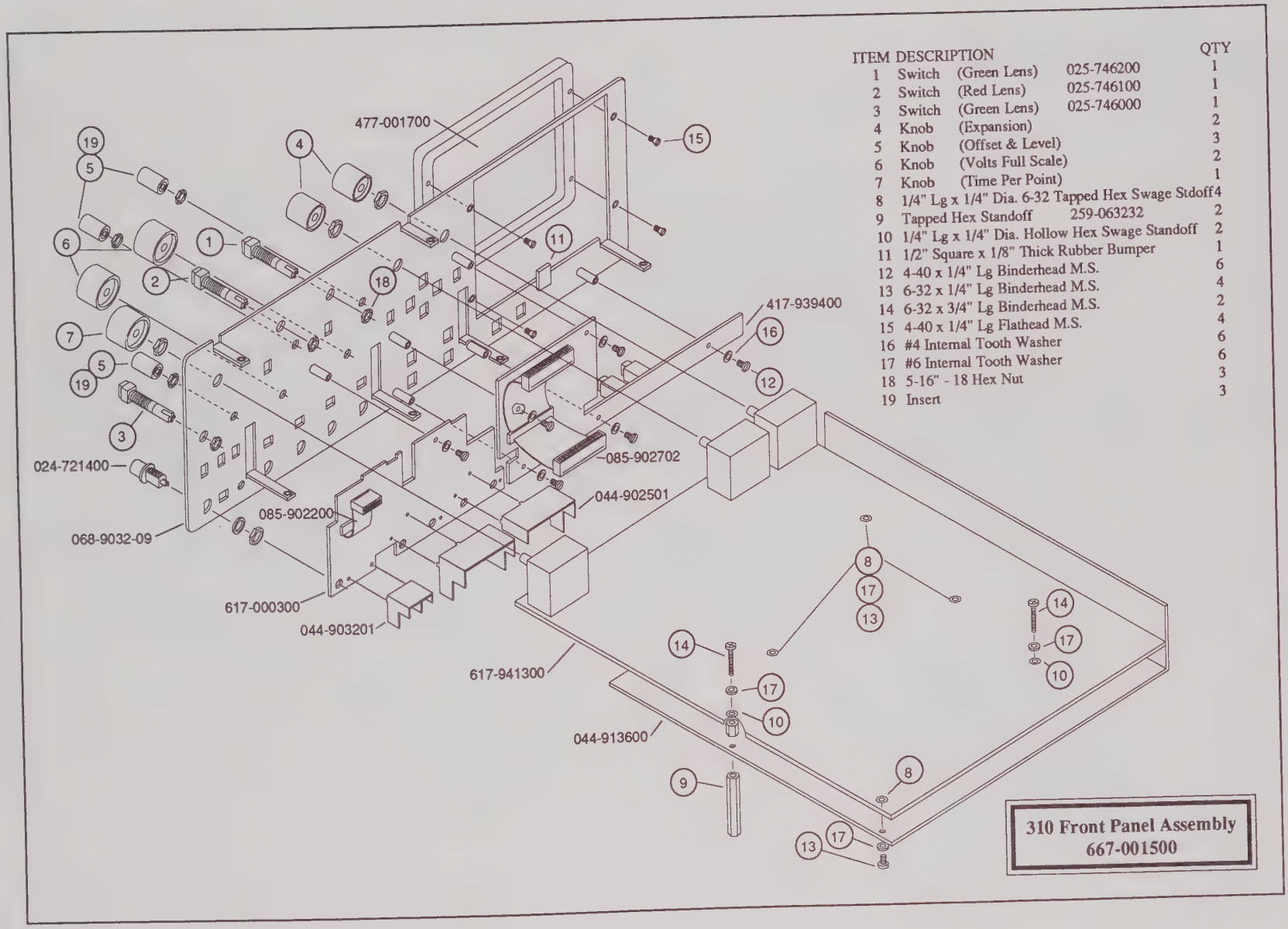
Item	Description	Part Number
A	DIP Switch, 8 position	025-763400
B	RS-232 Connector, 25 pin, Female	024-774900
C	RS-232 Connector, 25 pin, Male	024-769500
D	IEEE-488 Connector, 24 pin, Female	024-793000
E	RS-232 Connector Mounting Screw	093-702100
F	IEEE-488 Connector Mounting Screw	093-705100

310 REAR PANEL CONTROLS



310 REAR PANEL CONTROL PART NUMBERS

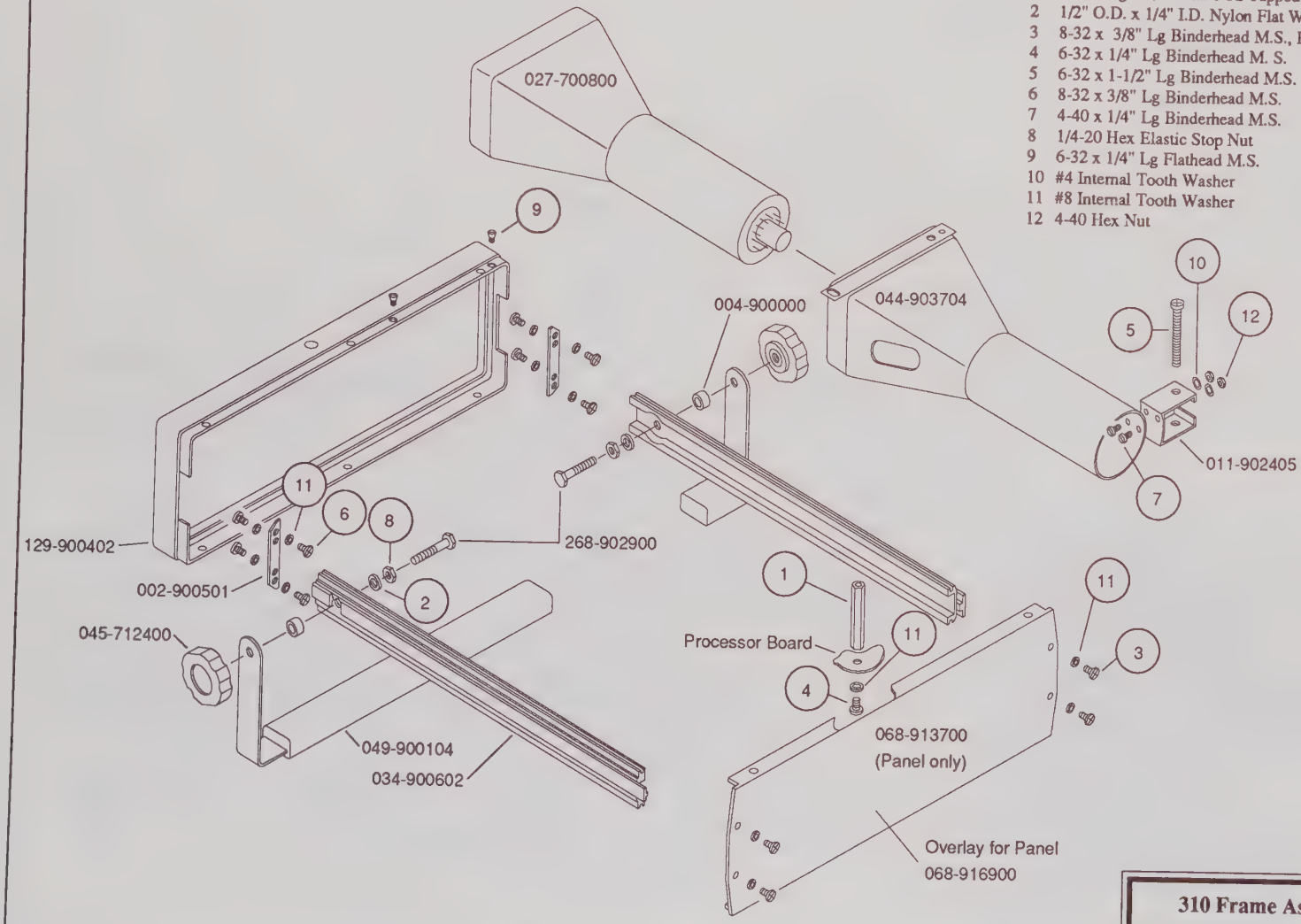
Item	Description	Part Number	Item	Description	Part Number
A	Potentiometer	026-714100	D	Input BNC	024-721400
	Knob	045-705200			
	Plastic Insulator	032-702500	E	Ground Lug	060-703600
			F	Connector	024-774900
B	Switch (Voltage)	025-746300			
	Plastic Cover	042-901100	G	Cord Wrap Foot	040-900003
C	Switch (On/Off)	025-743100	H	Power and Voltage	114-711000



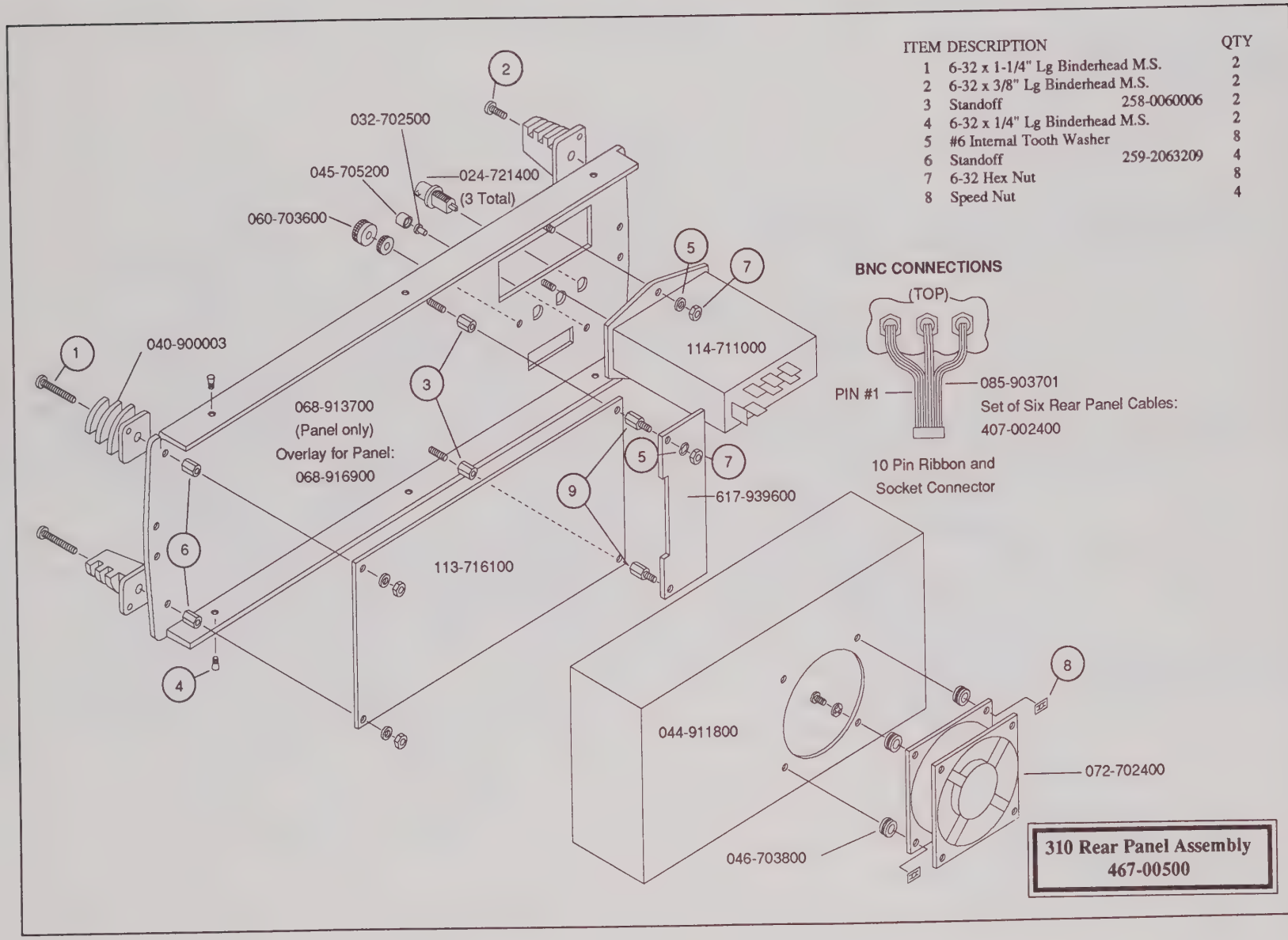
ITEM	DESCRIPTION			QTY
1	Switch	(Green Lens)	025-746200	1
2	Switch	(Red Lens)	025-746100	1
3	Switch	(Green Lens)	025-746000	1
4	Knob	(Expansion)		2
5	Knob	(Offset & Level)		3
6	Knob	(Volts Full Scale)		2
7	Knob	(Time Per Point)		1
8	1/4" Lg x 1/4" Dia. 6-32 Tapped Hex Swage Stdoff			4
9	Tapped Hex Standoff		259-063232	2
10	1/4" Lg x 1/4" Dia. Hollow Hex Swage Standoff			2
11	1/2" Square x 1/8" Thick Rubber Bumper			1
12	4-40 x 1/4" Lg Binderhead M.S.			6
13	6-32 x 1/4" Lg Binderhead M.S.			4
14	6-32 x 3/4" Lg Binderhead M.S.			2
15	4-40 x 1/4" Lg Flathead M.S.			4
16	#4 Internal Tooth Washer			6
17	#6 Internal Tooth Washer			6
18	5-16" - 18 Hex Nut			3
19	Insert			3

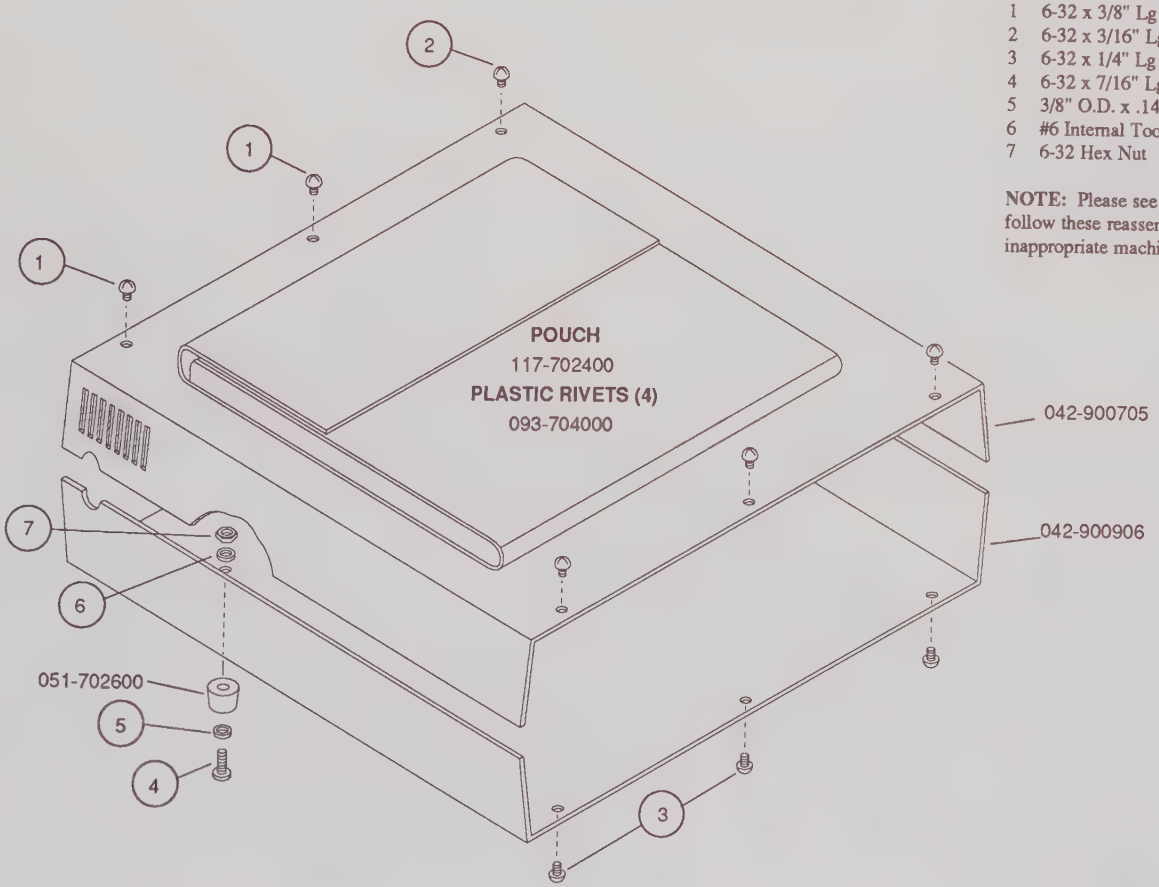
310 Front Panel Assembly
667-001500

ITEM	DESCRIPTION	QTY
1	1-3/8" Lg x 1/4" Dia. 6-32 Tapped Hex Stndoff	1
2	1/2" O.D. x 1/4" I.D. Nylon Flat Washer	2
3	8-32 x 3/8" Lg Binderhead M.S., Black	4
4	6-32 x 1/4" Lg Binderhead M. S.	11
5	6-32 x 1-1/2" Lg Binderhead M.S.	1
6	8-32 x 3/8" Lg Binderhead M.S.	8
7	4-40 x 1/4" Lg Binderhead M.S.	2
8	1/4-20 Hex Elastic Stop Nut	2
9	6-32 x 1/4" Lg Flathead M.S.	3
10	#4 Internal Tooth Washer	2
11	#8 Internal Tooth Washer	12
12	4-40 Hex Nut	2



310 Frame Assembly

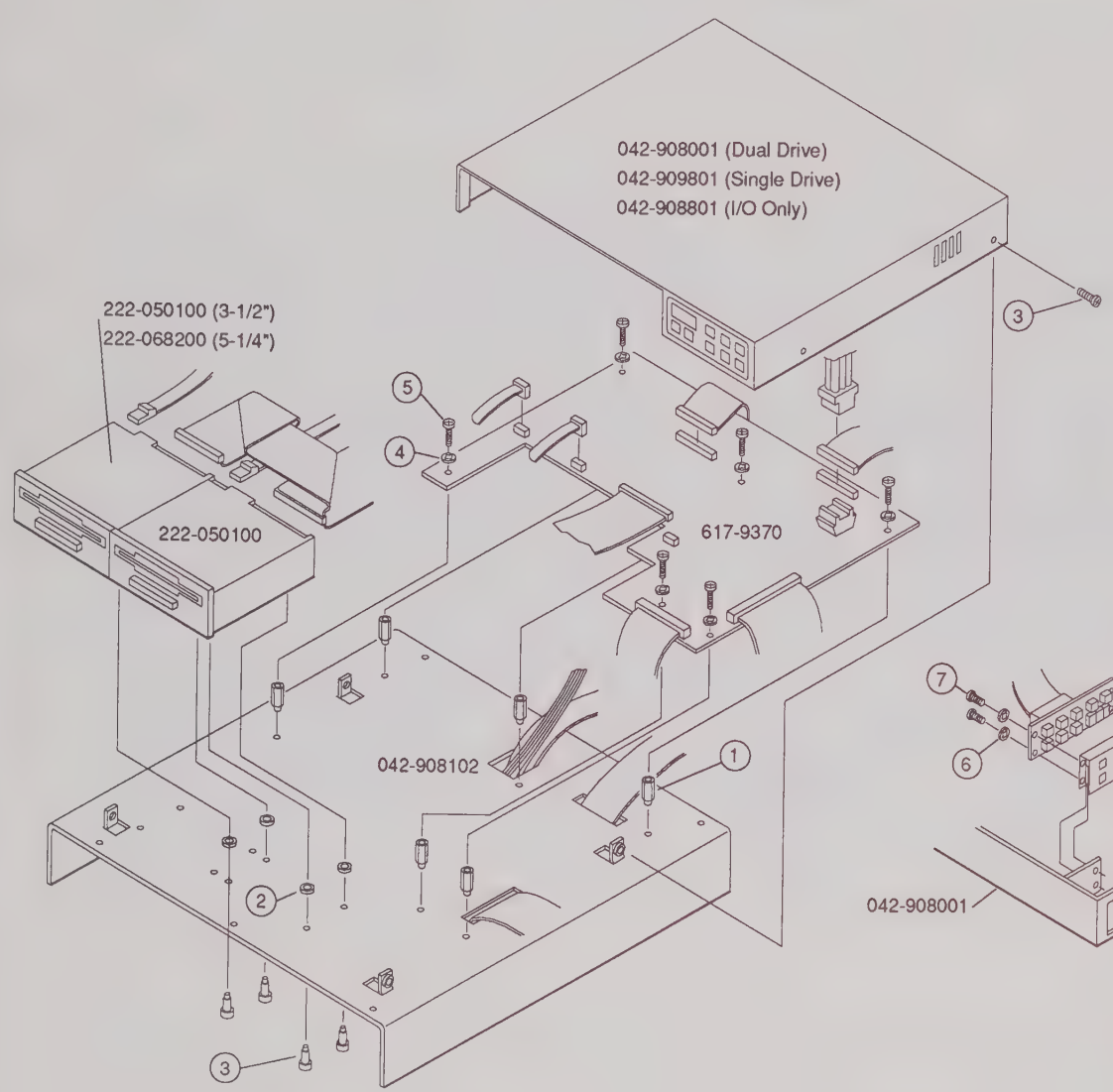

ITEM DESCRIPTION QTY
1 6-32 x 1-1/4" Lg Binderhead M.S. 2
2 6-32 x 3/8" Lg Binderhead M.S. 2
3 Standoff 258-0060006 2
4 6-32 x 1/4" Lg Binderhead M.S. 2
5 #6 Internal Tooth Washer 8
6 Standoff 259-2063209 4
7 6-32 Hex Nut 8
8 Speed Nut 4
032-702500
045-705200
024-721400
(3 Total)
060-703600
040-900003
068-913700
(Panel only)
Overlay for Panel:
068-916900
114-711000
617-939600
113-716100
044-911800
072-702400
046-703800
BNC CONNECTIONS
(TOP)
PIN #1
085-903701
Set of Six Rear Panel Cables:
407-002400
10 Pin Ribbon and
Socket Connector
310 Rear Panel Assembly
467-00500



ITEM	DESCRIPTION	QTY
1	6-32 x 3/8" Lg Binderhead M.S., Black	2
2	6-32 x 3/16" Lg Binderhead M.S., Black	1
3	6-32 x 1/4" Lg Binderhead M.S., Black	9
4	6-32 x 7/16" Lg Binderhead M.S.	2
5	3/8" O.D. x .145 I.D. Flat Washer	2
6	#6 Internal Tooth Washer	2
7	6-32 Hex Nut	2

NOTE: Please see page 8-19 for reassembly. It is important to follow these reassembly directions to prevent shorts caused by inappropriate machine screw placement.

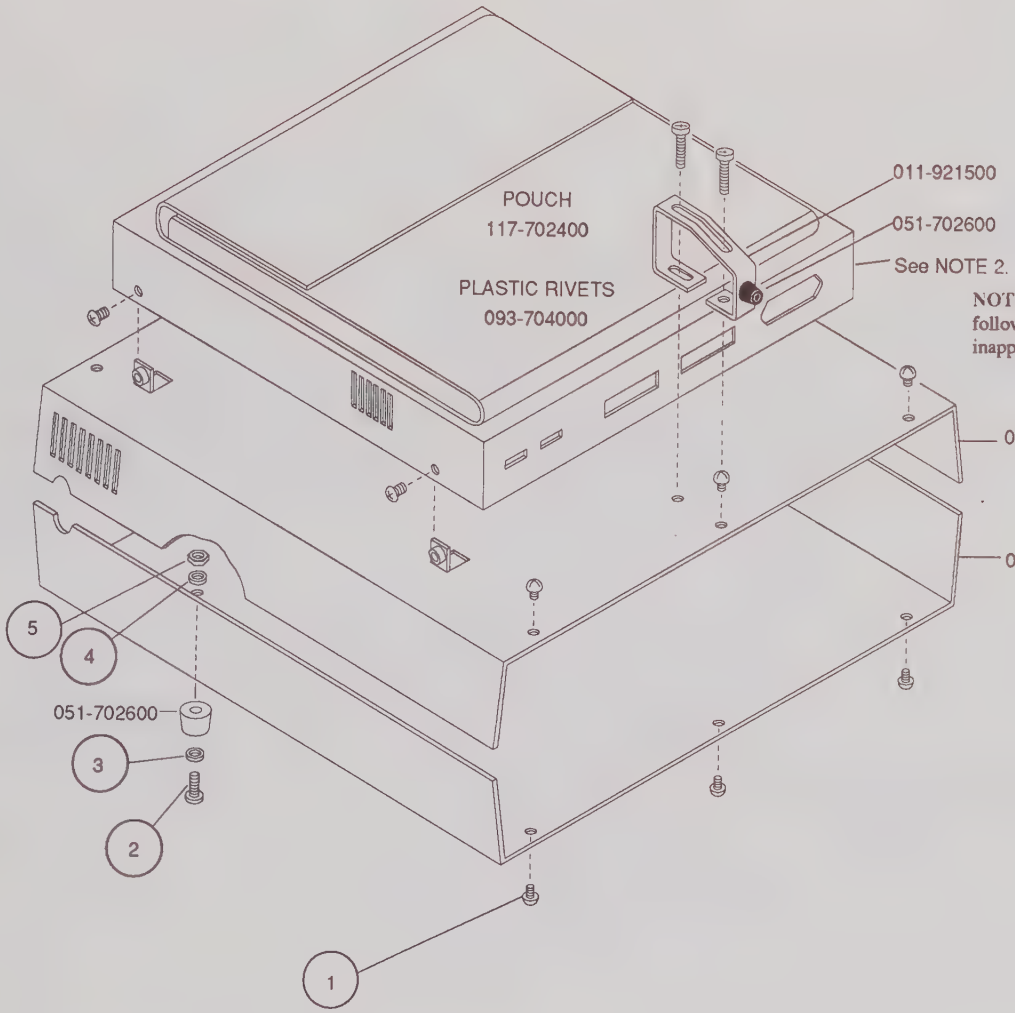
310 Cover Assembly



ITEM	DESCRIPTION		QTY
1	Swage Standoff	260-1063208	6
2	Grommet	046-708000	8
3	Mounting Screw	232-M30500	8
4	#6 Internal Tooth Washer		6
5	6-32 x 5/16" Lg Binderhead M.S.		6
6	#4 Internal Tooth Washer		4
7	4-40 1/4" Lg Binderhead M.S.		4

NOTE: For Single Drive and I/O only units, check part numbers in Parts List section. Some numbers vary from similar parts in Dual Drive models.

Dual Drive Assembly
847-310DD



ITEM	DESCRIPTION	QTY
1	6-32 x 1/4" Lg Binderhead M.S., Black	9
4	6-32 x 7/16" Lg Binderhead M.S.	2
5	3/8" O.D. x .145 I.D. Flat Washer	2
6	#6 Internal Tooth Washer	2
7	6-32 Hex Nut	2
Not Shown:		
	6-32 x 3/8" Lg Binderhead M.S., Black	2
	6-32 x 3/16" Lg Binderhead M.S., Black	1

NOTE 1: Please see page 8-19 for reassembly. It is important to follow these reassembly directions to prevent shorts caused by inappropriate machine screw placement.

NOTE 2:		
	Cover for Dual Drive	042-908001
	Cover for Single Drive	042-909801
	Cover for I/O Penthouse	042-908801

Cover Assembly w/Penthouse

310 PROCESSOR BOARD

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	617-933400	310 PROCESSOR BD	1.00
1	011-723103	BRKT/HI VOLT XFORMER/EXPL	1.00
1	017-903100	LABEL/HIGH VOLTAGE (GENERIC)	3.00
1	023-747000	CAP/ /.047M 50 Z EP A	2.00
1	024-774900	CON/ 25M RC SO	1.00
1	026-714100	POT/ 250K D 625-8747 CL	1.00
1	026-714300	POT/ 1M C 1W 1RC8741 TR	2.00
1	044-902403	310 SHIELD/3091 POWER SUP	1.00
1	051-900300	BUMPER/3091 PROCESSOR/FOAM	3.00
1	085-918901	CBL/20 COND 16" REMOTE CONT	1.00
1	116-723200	SUPP/.250 NYLON MSP-4N RP	4.00
1	241-080000	WSH/NMT .160X.380X.065 N	5.00
1	407-002101	CBL 310 CRT 13 COND Y	1.00
1	417-933400	310 PROC ASSY COMMON PARTS	1.00
*2	013-700900	JUMPER 2F HEADER/BLOCK	1.00
*2	013-701100	CONTACT/MALE CONTACT JUMPER	4.00
*2	015-712200	PIN M SOL 1223	6.00
*2	019-900000	XFORMER/3091-310 H.V.	1.00
*2	021-702200	TRN/NPN 2N3903 1W 40V C MO	6.00
*2	021-711100	TRN/NPN MPSU10 1W 300V I MO	5.00
*2	021-712100	TRN/VMOS BS250 .8W 45V C IT	1.00
*2	021-716200	TRN/FEN IRF110 1W 100V J	1.00
*2	022-703200	DIO/ZNR 1N5256 .5W 30V A MO	1.00
*2	022-703700	DIO/ZNR 1N5231 .5W 5.1V A MO	1.00
*2	022-706900	DIO/TFR FM50 50W 5KV A SE	3.00
*2	022-713000	DIO/RCT FDH300 30W 150V G FC	3.00
*2	022-719800	DIO/TFR 1N4152 .5W 30V A FC	11.00
*2	022-730200	DIO/LDR .1W 1.7V R HP	1.00
*2	023-700100	CAP/ /100P 500 J MI A	1.00
*2	023-700200	CAP/ /1000P 100 J MI R	1.00
*2	023-702400	CAP/ /.01M 100 M CE A	6.00
*2	023-707300	CAP/ /1M 250 K MY A	2.00
*2	023-711200	CAP/ /220M 10 K TA A	1.00
*2	023-711300	CAP/ /.1M 250 K PE R	3.00
*2	023-719400	CAP/ /.01M 3000 M CE R	7.00
*2	023-725900	CAP/VA/3.5-10P 63 CE O	1.00
*2	023-726300	CAP/ /22M 35 K TA R	7.00
*2	023-726400	CAP/ /4.7M 10 K TA R	7.00
*2	023-726500	CAP/ /1M 35 K TA R	1.00
*2	023-726600	CAP/ /6.8M 35 K TA R	8.00
*2	023-728100	CAP/ /.0047M 6000 M CE R	1.00
*2	023-732700	CAP/ /.002M 50 G CE R	1.00

310 PROCESSOR BOARD (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
*2	023-747000	CAP/ /.047M 50 Z EP A	54.00
*2	024-721300	CON/ 24F DP SO 641266-3 AM	5.00
*2	024-724800	CON/ 40F DP SO 641268-3 AM	4.00
*2	024-730900	CON/ 28F DP SO 641267-3 AM	1.00
*2	024-733200	CON/ 6M HR SO 9-350259 AM	1.00
*2	024-739800	CON/ 3M HR SO 2210-2031 MO	1.00
*2	024-759900	CON/ 1F HR SO SS-120-T-2 SAM	24.00
*2	024-779200	CON/ 2M HR SO HLAS100-2 PN	1.00
*2	024-795300	CON/ 26M HR SO DUAL/ST AP	1.00
*2	024-798600	CON/ 50M HR SO D/ST APT	2.00
*2	024-807300	CON/ 10M HR SO S AP	2.00
*2	024-808200	CON/ 20M HR SO S AP	4.00
*2	024-810000	CON/ 34M HR SO S APT	1.00
*2	026-705500	POT/ 1K A .7W 3006P1102 BR	1.00
*2	026-705600	POT/ 2K A .7W 3006P1202 BR	4.00
*2	026-706200	POT/ 50K A .7W 3006P1503 BR	2.00
*2	026-710500	POT/ 20K A .5W 3299W1203 BR	1.00
*2	026-711700	POT/ 5K A .5W ET14P5K ME	2.00
*2	067-700300	CORE/E1960-S-298A	2.00
*2	070-703400	FUSE/.75 A/276.750 LITTLEFUSE	2.00
*2	070-706000	FUSE/1A 256001 PICO II	2.00
*2	070-708700	FUSE/7A 256007 PICO II LFU	1.00
*2	100-700700	RNET/I/ 4.7K 10P 9R P 2	4.00
*2	100-701700	RNET/I/ 220/330 10P 16R T 5	2.00
*2	101-010500	RES/1M 10% 1/2W	1.00
*2	101-022300	RES/22K 10% 1/2W	1.00
*2	101-022500	RES/2.2M 10% 1/2W	3.00
*2	106-703600	RES/200M 10% 1W	1.00
*2	106-704700	RES/30K 5% 2W NON-IND	4.00
*2	121-703900	REG +12V .5A LM341P-12 E NA	2.00
*2	121-704000	REG -12V .5A LM79M12CP E NA	2.00
*2	134-724900	IC/74S169 DIG P D COUN BI U	1.00
*2	134-728800	IC/PRO/28S42 P D 512X8 60N	1.00
*2	134-734300	IC/CPU/2901 P D 4B SLICEB	4.00
*2	134-773000	IC/567 INT C D 12B 2MHZ	2.00
*2	134-775600	IC/3632 MEM C D 4KX8 40NS	5.00
*2	134-804100	IC/3242 INT P D CTRL REFS	1.00
*2	134-806100	IC/DRA/4416 P D 16KX4 150	3.00
*2	134-886600	IC/18S030 MEM P D 32X8 35NS	6.00
*2	191-709300	CYRS/36MHZ	1.00
*2	201-100000	RES/100 1% 1/8W	1.00
*2	260-1060016	STOF SWA #6 1 .250 S	1.00
*2	260-1063210	STOF SWA 6-32X5/8 .250 SS	1.00
*2	000-933405	PCB/310 PROC BD Y	1.00

310 PROCESSOR BOARD (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
*2	022-703000	DIO/ZNR 1N5232 .5W 5.6V A MO	2.00
*2	022-705100	DIO/ZNR 1N5268 .5W 82V A MO	1.00
*2	022-738500	DIO RECT 1N4004 400V 1A G	10.00
*2	024-827700	CON/ 16F DP SO 2640358-3 AM	7.00
*2	024-827800	CON/ 18F DP SO 2640359-3 AM	3.00
*2	024-827900	CON/ 20F DP SO 2640464-3 AM	1.00
*2	100-705000	RNET/D/ 47 16P 8R I 2	2.00
*2	134-710400	IC/TTL/74S00 P D NAND-2	3.00
*2	134-711200	IC/74S74 DIG P D F/F DUAL	3.00
*2	134-711500	IC/555 LIN P D TIMER	1.00
*2	134-712800	IC/74LS00 DIG P D NAND-2	2.00
*2	134-713200	IC/74LS74 DIG P D F/F DUAL	1.00
*2	134-716200	IC/74S175 DIG P D F/F QUAD	2.00
*2	134-717500	IC/TTL/74S138 P D MUX 3-8	2.00
*2	134-718300	IC/TTL/74S02 P D NOR-2	2.00
*2	134-718500	IC/TTL/74S182 P D CRY LK AH	1.00
*2	134-720400	IC/74LS02 DIG P D NOR-2	1.00
*2	134-722700	IC/74LS08 DIG P D AND-2	2.00
*2	134-723800	IC/74LS169 DIG P D COUN BI U	1.00
*2	134-724000	IC/TTL/74LS258 P D MUX 2-1	1.00
*2	134-724900	IC/74S169 DIG P D COUN BI U	2.00
*2	134-729400	IC/6N137 P D OPI 8PIN	1.00
*2	134-730900	IC/TTL/74LS367 P D DRVR TRI	4.00
*2	134-733400	IC/TTL/74LS30 P D NAND-8	1.00
*2	134-736800	IC/74LS374 DIG P D F/F OCT D	3.00
*2	134-739000	IC/74S374 DIG P D F/F OCT D	4.00
*2	134-739100	IC/TTL/74LS244 P D BUFF TRI	1.00
*2	134-739200	IC/74S32 DIG P D OR-2	2.00
*2	134-739400	IC/74S157 DIG P D MUX 2-1	1.00
*2	134-739500	IC/74LS245 DIG P D BUFF TRI	3.00
*2	134-741700	IC/75188 INT P D DRVR RS23	1.00
*2	134-745400	IC/74S64 DIG P D AND OR IN	2.00
*2	134-746400	IC/74S158 DIG P D MUX 2-1	1.00
*2	134-753700	IC/339 LIN P D COMP QUAD	1.00
*2	134-756300	IC/556 LIN P D TIMER DUA	1.00
*2	134-756400	IC/747 LIN P D DUAL	1.00
*2	134-763100	IC/74S112 DIG P D F/F DUA J	2.00
*2	134-764300	IC/74S251 DIG P D MUX 8-1	1.00
*2	134-768400	IC/74LS442 DIG P D TRANS BUS	7.00
*2	134-893200	IC/74HC4050NDIG P D BUFF HEX	1.00
*2	134-897400	IC/MOS/4050 P D BUFF HEX	1.00
*2	201-100100	RES/1K 1% 1/8W	6.00
*2	201-100200	RES/10K 1% 1/8W	9.00
*2	201-100300	RES/100K 1% 1/8W	3.00

310 PROCESSOR BOARD (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
*2	201-105100	RES/1.05K 1% 1/8W	2.00
*2	201-124100	RES/1.24K 1% 1/8W	1.00
*2	201-127300	RES/127K 1% 1/8W	1.00
*2	201-150100	RES/1.5K 1% 1/8W	1.00
*2	201-178100	RES/1.78K 1% 1/8W	2.00
*2	201-200000	RES/200 1% 1/8W	2.00
*2	201-200200	RES/20K 1% 1/8W	2.00
*2	201-200300	RES/200K 1% 1/8W	1.00
*2	201-221100	RES/2.21K 1% 1/8W	1.00
*2	201-221300	RES/221K 1% 1/8W	1.00
*2	201-226200	RES/22.6K 1% 1/8W	1.00
*2	201-243300	RES/243K 1% 1/8W	1.00
*2	201-274000	RES/274 1% 1/8W SMD	1.00
*2	201-274100	RES/2.74K 1% 1/8W	2.00
*2	201-274300	RES/274K 1% 1/8W	1.00
*2	201-316100	RES/3.16K 1% 1/8W	1.00
*2	201-332000	RES/332 1% 1/8W	5.00
*2	201-392000	RES/392 1% 1/8W	4.00
*2	201-402300	RES/402K 1% 1/8W	1.00
*2	201-475100	RES/4.75K 1% 1/8W	21.00
*2	201-475300	RES/475K 1% 1/8W	3.00
*2	201-475900	RES/47.5 1% 1/8W	6.00
*2	201-487000	RES/487 1% 1/8W	1.00
*2	201-487200	RES/48.7K 1% 1/8W	1.00
*2	201-499100	RES/4.99K 1% 1/8W	3.00
*2	201-536200	RES/53.6K 1% 1/8W	1.00
*2	201-634100	RES/6.34K 1% 1/8W	2.00
*2	201-698200	RES/69.8K 1% 1/8W	1.00
*2	201-750100	RES/7.5K 1% 1/8W	1.00
*2	201-825000	RES/825 1% 1/8W	1.00
*2	201-825100	RES/8.25K 1% 1/8W	1.00
*2	201-887200	RES/88.7K 1% 1/8W	2.00
*2	201-909100	RES/9.09K 1% 1/8W	1.00

310 CURSOR BOARD

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	417-939400	CURSOR BOARD	
1	023-726400	CAP/ /4.7M 10 K TA R	1.00
1	025-739200	SW/PB 1P1TM BLK	10.00
1	025-745800	SW/TO 2P2T3PS A23KP-CSK NK	1.00
1	025-745900	SW/TO 2P2T3PS A29KP-CSK NK	1.00
1	085-902702	CBL/26 COND 3091 CUR/PROC/ADC	1.00
1	000-939400	PCB/3091 CURSOR (310 CHANGES)	1.00
1	022-719800	DIO/TFR 1N4152 .5W 30V A FC	14.00
1	023-747000	CAP/ /.047M 50 Z EP A	1.00
1	201-150000	RES/150 1% 1/8W	1.00

310 ADC BOARD

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	617-941300	310 ADC BOARD	
1	000-941301	PCB/310 ADC BD NEW	1.00
1	021-702200	TRN/NPN 2N3903 1W 40V C MO	2.00
1	022-738500	DIO RECT 1N4004 400V 1A G	6.00
1	023-700100	CAP/ /100P 500 J MI A	4.00
1	023-700200	CAP/ /1000P 100 J MI R	4.00
1	023-700500	CAP/ /250P 500 J MI A	4.00
1	023-715500	CAP/VA/1.5-.25P 1000 TF O	8.00
1	023-716400	CAP/ /12P 300 D MI R	4.00
1	023-717300	CAP/ /68P 300 D MI R	4.00
1	023-717600	CAP/ /15P 300 D MI R	4.00
1	023-717900	CAP/ /8P 300 JA MI R	6.00
1	023-718200	CAP /27P 300 J MI R	16.00
1	023-719600	CAP/ /18P 300 J MI R	4.00
1	023-721000	CAP/ /100M 16 M TA A	20.00
1	023-726500	CAP/ /1M 35 K TA R	22.00
1	023-738400	CAP/ /.022M 400 K PE R	4.00
1	023-756600	CAP/ /.33P 400 DB CE A	4.00
1	023-759600	CAP/ /22P 300 J MI R	4.00
1	023-763700	CAP/ /150P 500 J MI R	2.00
1	023-767600	CAP/ /6800M 25 ZG AL R	2.00
1	024-733200	CON/ 6M HR SO 9-350259 AM	1.00
1	024-738500	CON/ 72M HR SO CAD72SP10	10.00
1	024-740700	CON/ 20F DP SO 641264-3 AM	1.00
1	024-773100	CON/ 1F HR SO 226287-2 AM	4.00
1	024-798500	CON/ 26M HR SO D/ST APT	1.00
1	024-798600	CON/ 50M HR SO D/ST APT	1.00
1	024-808200	CON/ 20M HR SO S AP	1.00
1	024-812500	CON 14M HDR/SOL D/ST A	1.00
1	024-862300	CON/ 8M HR SO S BBS-108GF	2.00
1	025-739700	SW/TH 1P1T08 76PSB08S GR	1.00
1	025-744600	SW/TO 2P2T A-23KV NK	2.00
1	025-744800	SW/RO 1P26PS 1760SMPREL S	3.00
1	025-766900	SW/RO 9PS 2536P/REL-18-1 SG	2.00
1	026-708000	POT/ 2K A .5W 3299W1202 BR	2.00
1	026-710400	POT/ 100 A .5W 3299W1101 BR	4.00
1	026-715500	POT/1K10K D 625-8739 CL	2.00
1	029-710200	RELAY/ 12V PC BIFURCATED	20.00
1	044-911100	SHIELD/4180,310 ADC LONG 1	1.00
1	044-911400	SHIELD/4180,310,GEN SHORT	6.00
1	085-902500	CBL/34 PCB/HDR 3091 ADC SY	1.00
1	098-707200	HTSINK/6022B TH	2.00

310 ADC BOARD (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
1	098-900400	HEAT SINK/3091/A-D CONVERTER	2.00
1	100-700700	RNET/I/ 4.7K 10P 9R P 2	1.00
1	100-701500	RNET/I/ 10K 10P 9R P 2	1.00
1	100-702400	RNET/I/ 330 10P 9R P 2	1.00
1	100-705800	RNET/I/ 4.7K 8P 7R P 2	1.00
1	100-710500	RNET/I/ 10K 8P 7R P 2	1.00
1	100-900100	RNET/I/ATTENUAT 5P R .1	4.00
1	105-027300	RES/27K 5% 2W	4.00
1	106-707800	RES/MATCH 1% (1)200 (2 100	2.00
1	121-704000	REG -12V .5A LM79M12CP E NA	2.00
1	121-706000	REG 12V 5% TL780 12CKC MO	4.00
1	134-768800	IC/CPU/8253 P D TIMER PRO	1.00
1	134-791200	IC/TTL/74ALS576 P D F/F OCT D	2.00
1	134-878800	IC/9003 INT P D 12B 1MHZ	2.00
1	201-237200	RES/23.7K 1% 1/8W	2.00
1	201-953100	RES/9.53K 1% 1/8W	2.00
1	022-702900	DIO/ZNR 1N5240 .5W 10V A MO	8.00
1	022-713000	DIO/RCT FDH300 30W 150V G FC	8.00
1	022-714100	DIO/SCT HSCH1001 .9W 60V HP	2.00
1	022-719800	DIO/TFR 1N4152 .5W 30V A FC	34.00
1	022-738500	DIO RECT 1N4004 400V 1A G	6.00
1	023-747000	CAP/ /.047M 50 Z EP A	78.00
1	134-710400	IC/TTL/74S00 P D NAND-2	1.00
1	134-712800	IC/74LS00 DIG P D NAND-2	3.00
1	134-712900	IC/TTL/74LS04 P D INV HEX	1.00
1	134-713200	IC/74LS74 DIG P D F/F DUAL	10.00
1	134-718000	IC/74LS194 DIG P D REG SHI 4	1.00
1	134-718800	IC/74LS175 DIG P D F/F QUAD	1.00
1	134-719400	IC/TTL/74LS151 P D MUX 8-1	1.00
1	134-720400	IC/74LS02 DIG P D NOR-2	3.00
1	134-723800	IC/74LS169 DIG P D COUN BI U	6.00
1	134-730600	IC/3140 LIN P D GEN PURPO	2.00
1	134-732900	IC/74LS32 DIG P D OR-2	1.00
1	134-736800	IC/74LS374 DIG P D F/F OCT D	2.00
1	134-739100	IC/TTL/74LS244 P D BUFF TRI	1.00
1	134-745000	IC/74S133 DIG P D NAND-13	1.00
1	134-769500	IC/74LS125 DIG P D BUFF TRI	1.00
1	134-772500	IC/TTL/74ALS574 P D F/F OCT D	4.00
1	134-798100	IC/7124 MEM P D 512X8 35N	1.00
1	134-804500	IC/MOS/2803 P D DRVR RELA	2.00
1	134-896500	IC/404 LIN P D OPAMP B	2.00
1	134-896600	IC/606 LIN P D OPAMP B	2.00
1	201-100000	RES/100 1% 1/8W	10.00
1	201-100100	RES/1K 1% 1/8W	14.00

310 ADC BOARD (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
1	201-100200	RES/10K 1% 1/8W	21.00
1	201-100400	RES/1M 1% 1/8W	4.00
1	201-105200	RES/10.5K 1% 1/8W	2.00
1	201-130100	RES/1.3K 1% 1/8W	2.00
1	201-130300	RES/130K 1% 1/8W	2.00
1	201-200100	RES/2K 1% 1/8W	4.00
1	201-200500	RES/20M 1% 1/8W	4.00
1	201-249200	RES/24.9K 1% 1/8W	2.00
1	201-332000	RES/332 1% 1/8W	1.00
1	201-392100	RES/3.92K 1% 1/8W	4.00
1	201-475100	RES/4.75K 1% 1/8W	2.00
1	201-475900	RES/47.5 1% 1/8W	3.00
1	201-619100	RES/6.19K 1% 1/8W	2.00
1	201-953000	RES/953 1% 1/8W	2.00
1	260-1060004	STOF SWA #6 1/4 .250 SS	1.00
1	260-1063204	STOF SWA 6-32X1/4 .250 SS	2.00

310 TRIGGER BOARD

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	617-000300	TRIGGER BOARD	
1	023-702400	CAP/ /.01M 100 M CE A	8.00
1	023-710600	CAP/ /10P 1000 K CE R	1.00
1	023-711300	CAP/ /.1M 250 K PE R	6.00
1	023-725600	CAP/ /5P 300 K MI R	2.00
1	023-726600	CAP/ /6.8M 35 K TA R	4.00
1	023-763500	CAP/ /47P 500 J MI A	1.00
1	023-763600	CAP/ /250P 500 J MI A	2.00
1	024-733100	CON/ 14F DP SO 641261-3 AM	1.00
1	024-773100	CON/ 1F HR SO 226287-2 AM	4.00
1	025-743200	SW/TO 2P2T2PS A-22KB NK	1.00
1	025-743300	SW/TO 2P2T3PS A-23KB NK	2.00
1	025-745800	SW/TO 2P2T3PS A23KP-CSK NK	1.00
1	025-746700	SW/TO 2P2T3PS A24KB ON-ON-ON	4.00
1	026-716600	POT/ 25K A 1W CM44481 CL	1.00
1	044-902501	SHIELD/3091 TRIGGER #1	2.00
1	044-903201	SHIELD/3091 TRIGGER BD. #2	1.00
1	085-903102	CBL/14 COND 2" TRIGGER/ADC	1.00
1	121-703200	REG 79L05 B	1.00
1	133-900402	HYB/3091 TRIG. RESITOR NET.	1.00
1	134-740200	IC/084 LIN P D FET 4BIPO	1.00
1	134-755400	IC/8T20 DIG P D MONO BIDI	1.00
1	134-896700	IC/OPA/301 P D GEN PURPO	1.00
1	000-912105	PCB/3091 TRIGGER	1.00
1	022-719800	DIO/TFR 1N4152 .5W 30V A FC	6.00
1	023-747000	CAP/ /.047M 50 Z EP A	1.00
1	201-100200	RES/10K 1% 1/8W	3.00
1	201-100400	RES/1M 1% 1/8W	4.00
1	201-324200	RES/32.4K 1% 1/8W	1.00
1	201-475100	RES/4.75K 1% 1/8W	1.00

310 FRONT PANEL ASSEMBLY

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	667-001500	310 FT PANEL ASSY NEW ADC	
1	044-913500	SHIELD/310 TRIGGER #3	2
1	044-913600	SHIELD/310 3091 ADC	1
1	068-916101	PAN/310 FRT PAN W/OUT BUB MEM	1
1	085-903602	CBL/COAX 5.5" RG-6	4
1	085-916800	CBL/ 50 COND 9" HDR/HDR/HDR	1
1	259-0063232	SPCR TP 6-32X2.000 .250 AL	1
1	260-1063216	STOF SWA 6-32X1 .250 S	1
1	407-002700	CBL ASSY/PRE-TRIGGER SWITCH	1
1	417-939400	310 CURSOR BD ASSY (PAL=6)	1
1	617-000300	310/3091 TRIGGER BD ASSY	1
1	617-941300	310 ADC BD NEW	1
1	002-901400	PLATE/3091 TAB	1
1	024-721400	CON/ 1F CL SO 31-010 AP	5
1	025-746000	SW/PP 1P1T 19-289.0 GREEN EAO	1
1	025-746100	SW/MO 1P1TM 19-159.0 RED EA	1
1	025-746200	SW/MO 1P1TM 19-159.0 GREEN EA	1
1	068-903209	PAN/3091 FRONT SUB	1
1	085-902200	CBL/8 COND TIME/PT. SWITCH SY	1
1	024-764200	CON/ 1F HR SO 026-1800 SEL	1
1	035-704800	BUTT/AT467K BLACK .370" NK	12

310 DIGITAL SCOPE FRAME ASSEMBLY

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	887-310	310 DIGITAL SCOPE	
1	085-718300	PROBE/X1 COLINE 906-90-604	2
1	085-725800	CORD/A/C/LINE 17745 BE	1
1	268-903000	INSERT/PLASTIC DISKETTE MAN	1
1	269-907600	MANUAL/310 OPERATING	1
*2	269-908300	BINDER/9"X8 1/2" STRAIGHT D W	1
1	467-000500	310 REAR PNL (3110 P.S. & EMI	1
*2	024-779100	CON/ 2F SU ID CEI00F24-2 P	1
*2	044-911800	SHIELD/310 PWR SPLY 3110 W/EM	1
*2	061-710600	TERM/F DISCONNECT	2
*2	068-913700	PAN/310 REAR W/EMI MODULE	1
*2	068-916900	PAN/310 REAR OVERLAY	1
*2	070-716200	FUSE/2A 5X20MM 217 TYPE F LF	2
*2	113-716100	PWR SUP/+5+-15 100W 3110PWRGE	1
*2	114-711000	FLTR/EMI 10AMP 10CR3A 310	1
*2	259-2063209	SPCR TP 6-32 X 9/16	2
*2	407-002400	CBL/310 R.P. SET (3110 W/EMI	1
**3	015-706401	PIN F 18-26GA 350665-1 TIN AM	36
**3	015-725100	PIN F 18-24GA 08-50-0189	4
**3	024-726900	CON/ 6F RC CP 1-350241 AM	6
**3	024-828900	CON/ 3F RC CP 26034030	1
**3	024-881000	CON/ 5F/HR SO S 26-03-4050MO	1
**3	061-704001	TERM/RING 16-14GA #6 INSULATE	2
**3	061-710600	TERM/F DISCONNECT	6
*2	617-939600	310 PWR SPLY WIRNG ASSY W/EMI	1
*2	046-703800	GRM/ID .125 OD .343	4
*2	051-700700	BUMPER/SJ-5017	1
*2	051-701900	BUMPER/SJ-5008 1/8" BLACK MM	1
*2	072-702400	FAN/12V DC BRUSH	1
*2	258-0060006	SPCR NT #6 X 3/8 .250 AL	2
*2	259-2063206	SPCR TP 6-32X3/8 .250 SS	2
*2	024-721400	CON/ 1F CL SO 31-010 AP	3
*2	040-900003	FOOT/3091 CORD WRAP W/SPACER	4
**3	258-0060060	SPCR NT #6 X 3/8 .250 AL	1
*2	060-703600	POST/BINDING 7/16" #110 HH	1
*2	085-903701	CBL/10 COND 6" 3091 PEN BNC	1
1	477-000100	3091/310 FRAME MECH. ASSY.	1
*2	040-901000	CLIP/310 HANDLE BOLT RETAINER	2
*2	044-903704	SHIELD/310 CRT	1
*2	045-712400	KNOB/CR-30 1/4-20	2

310 DIGITAL SCOPE FRAME ASSEMBLY (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
*2	049-900104	HANDLE/310	1
**3	049-900302	HANDLE/3091 MACHND & PRETREAT	1
***4	112-900601	EXTRUSION/3091	1
*2	268-902900	MOUNTING SCREW-3091 HANDLE	2
*2	407-002600	CBL/310 CRT ANODE ASSEMBLY	1
**3	024-712000	CON/ 1M CRT ANODE	1
*2	002-900501	PLATE/3091 EXTRUSION MOUNTING	2
*2	004-900000	BUSH/3091 HANDLE	2
*2	011-902405	BRKT/3091 CRT	1
*2	017-716500	LABEL/SERIAL NUMBER	1
*2	027-700800	CRT/140-DEB31 5" CURVED FACE	1
*2	034-900602	RAIL/3091 SIDE	2
**3	112-900401	EXTRUSION/SIDE RAIL(310 & 800	16
*2	051-701900	BUMPER/SJ-5008 1/8" BLACK MM	4
*2	051-703500	BUMPER/SJ-5003 MM	1
*2	129-900402	FRAME/3091 END CASTING	1
1	477-001700	BEZEL/GRATICULE ASSEMBLY	1
*2	164-700502	GRAT/BLUE	1
*2	268-703001	BEZEL/CRT FRONT PANEL	1
1	477-004300	310 FINALING KIT	1
*2	042-900906	COVER/3091/310 BOTTOM	1
*2	044-913800	SHIELD/310 PROCESSOR FRONT	1
*2	045-712100	KNOB/.7" BLACK KLN-700B-1/4	2
*2	045-712200	KNOB/.5" BLACK KLN-500B-1/8	3
*2	045-712300	KNOB/.9" BLACK KLN-900B-1/4	3
*2	051-700300	BUMPER/SJ-5018 1/4" BLACK MM	1
*2	258-1060004	SPCR NT #6X1/4" .250 NY	3
*2	259-0063218	SPCR TP 6-32X1 1/8 .250 SS	1
*2	051-702600	FOOT/757-R LAVELLE	4
*2	032-702500	INSUL/#6 SCREW 1/4" RP	1
*2	045-705200	KNOB/KU-401B 1/8 AL	1
*2	093-704000	FASTNR/PRESS 1/2"X11/64" BLK	4
*2	117-702400	BAG/3091 POUCH	1
1	617-933400	310 PROCESSOR BD ASSY	1
*2	407-002102	CBL/310 CRT 13 COND	1
**3	085-715801	CBL/12 COND CRT SPECIAL BUY	1
1	667-001200	USE 667-001500 APPROX. 4/4/8	1
*2	011-903000	4/4/88 BRKT/3091 ADC TO SHIEL	2
*2	044-902602	SHIELD/3091 ADC :	1
*2	068-916101	PAN/310 FRT PAN W/OUT BUB MEM	1
*2	085-916800	CBL/ 50 COND 9" HDR/HDR/HDR	1
*2	259-0063232	SPCR TP 6-32X2.000 .250 AL	1
*2	260-1063216	STOF SWA 6-32X1 .250 S	1
*2	407-002700	CBL ASSY/PRE-TRIGGER SWITCH	1

310 DIGITAL SCOPE FRAME ASSEMBLY (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
*2	417-939400	310 CURSOR BD ASSY (PAL=6)	1
*2	617-000300	310/3091 TRIGGER BD ASSY	1
*2	617-935500	4/4/88 310 ADC BD (WITH MOD B	1
*2	002-901400	PLATE/3091 TAB	1
*2	024-721400	CON/ 1F CL SO 31-010 AP	5
*2	025-746000	SW/PP 1P1T 19-289.0 GREEN EAO	1
*2	025-746100	SW/MO 1P1TM 19-159.0 RED EA	1
*2	025-746200	SW/MO 1P1TM 19-159.0 GREEN EA	1
*2	068-903209	PAN/3091 FRONT SUB	1
*2	085-902200	CBL/8 COND TIME/PT. SWITCH SY	1
*2	024-764200	CON/ 1F HR SO 026-1800 SEL	1
*2	035-704800	BUTT/AT467K BLACK .370" NK	12
*2	085-903602	CBL/COAX 5.5" RG-6	4

310 I/O BOARD

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	617-937000	310 I/O BOARD	
1	015-722900	PIN SOLDER TERMINAL 120-1032-	6.00
1	023-711900	CAP/ /.0047M 200 K PE A	1.00
1	023-726300	CAP/ /22M 35 K TA R	1.00
1	023-726400	CAP/ /4.7M 10 K TA R	13.00
1	023-726500	CAP/ /1M 35 K TA R	1.00
1	023-726600	CAP/ /6.8M 35 K TA R	1.00
1	023-740400	CAP/ /47P 1000 K CE R	2.00
1	023-750900	CAP/ /.047M 50 M CE R	1.00
1	024-724800	CON/ 40F DP SO 641268-3 AM	2.00
1	024-730900	CON/ 28F DP SO 641267-3 AM	1.00
1	024-733200	CON/ 6M HR SO 9-350259 AM	1.00
1	024-739500	CON/ 5M HR SO 2210-2051 MO	1.00
1	024-740700	CON/ 20F DP SO 641264-3 AM	2.00
1	024-769500	CON/ 25F RC SO H2R25RA28C HM	1.00
1	024-774900	CON/ 25M RC SO	1.00
1	024-793000	CON/ 24F PC SO 552791-1 AM	1.00
1	024-795300	CON/ 26M HR SO DUAL/ST AP	3.00
1	024-798600	CON/ 50M HR SO D/ST APT	1.00
1	024-808200	CON/ 20M HR SO S AP	1.00
1	024-810000	CON/ 34M HR SO S APT	1.00
1	024-865300	CON/ 4M HR SO S HLSS100-4	2.00
1	025-739600	SW/PB 1P1TM MDP AU05 IE	1.00
1	025-763400	SW/TO 8POS DIP DC08-AV	2.00
1	041-703600	XDUCER/AUDIO 6V SMX-06 ST	1.00
1	093-702100	FASTNR/SCR LOCK D20418-2 CIN	2.00
1	093-705100	FASTNR/IEEE CON 552633-3 AMP	1.00
1	100-701500	RNET/I/ 10K 10P 9R P 2	6.00
1	100-701700	RNET/I/ 220/330 10P 16R T 5	1.00
1	100-701900	RES NET/SIP 56 10PN 9RE	1.00
1	121-702300	REG 1.2 TO 37V 1.5A 317T E NA	1.00
1	134-728800	IC/PRO/28S42 P D 512X8 60N	1.00
1	134-739500	IC/74LS245 DIG P D BUFF TRI	1.00
1	134-751900	IC/75162 INT P D TRANS GPI	1.00
1	134-752100	IC/9914 CPU P D CTRL GPIB	1.00
1	134-758600	IC/7218 DIG C D DRVR LED-	1.00
1	134-803800	IC/9995 CPU P D 16B	1.00
1	134-812900	IC/16R6 CUS P D 35NS	1.00
1	134-869900	IC/27512 MEM C D 64KX8 200	1.00
1	134-870000	IC/8472 CPU C D CTRL FDSK	1.00
1	134-877000	IC/62256 MEM P D 32KX8 85N	1.00
1	163-703000	DISPLAY/7 SEGMENT HDSP-7801 G	1.00

310 I/O BOARD (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
1	191-706600	CRYS/16MHZ	1.00
1	191-715900	CRYS/12.000 MHZ 20PF	1.00
1	201-221200	RES/22.1K 1% 1/8W	10.00
1	000-937003	PCB/310 I/O BOARD	1.00
1	022-719800	DIO/TFR 1N4152 .5W 30V A FC	4.00
1	023-747000	CAP/ /.047M 50 Z EP A	15.00
1	100-703000	RNET/D/ 22 16P 5R P	1.00
1	100-704300	RNET/D/ 330 16P 8R I 2	1.00
1	134-712800	IC/74LS00 DIG P D NAND-2	2.00
1	134-712900	IC/TTL/74LS04 P D INV HEX	2.00
1	134-713200	IC/74LS74 DIG P D F/F DUAL	4.00
1	134-717900	IC/TTL/74LS86 P D XOR-2	1.00
1	134-718100	IC/TTL/74LS191 P D COUN BI U	1.00
1	134-720400	IC/74LS02 DIG P D NOR-2	1.00
1	134-720800	IC/TTL/74LS10 P D NAND-3	1.00
1	134-722400	IC/74LS139 DIG P D DMUX 2-4	2.00
1	134-722700	IC/74LS08 DIG P D AND-2	1.00
1	134-725300	IC/7406 DIG P D INV OC	1.00
1	134-731000	IC/74LS138 DIG P D DMUX 3-8	1.00
1	134-731500	IC/74LS259 DIG P D LATCH 8B	5.00
1	134-731600	IC/74LS251 DIG P D MUX 8-1	4.00
1	134-732900	IC/74LS32 DIG P D OR-2	2.00
1	134-739100	IC/TTL/74LS244 P D BUFF TRI	1.00
1	134-739300	IC/TTL/74S139 P D DECO 2-4	1.00
1	134-741600	IC/9902 CPU P D UART	3.00
1	134-741700	IC/75188 INT P D DRVR RS23	2.00
1	134-741800	IC/75189 INT P D RECV RS23	2.00
1	134-748400	IC/74LS38 DIG P D NAND-2	1.00
1	134-751700	IC/75160 INT P D TRANS GPI	1.00
1	134-772500	IC/TTL/74ALS574 P D F/F OCT D	6.00
1	134-812500	IC/74HC4040 DIG P D COUN BI	1.00
1	201-010000	RES/10 1% 1/8W	1.00
1	201-100200	RES/10K 1% 1/8W	3.00
1	201-100300	RES/100K 1% 1/8W	1.00
1	201-499000	RES/499 1% 1/8W	1.00
1	201-562900	RES/56.2 1% 1/8W	3.00
1	201-825000	RES/825 1% 1/8W	1.00
1	201-953900	RES/95.3 1% 1/8W	2.00
1	223-0256070	SCR 2-56X0.437 BND SL SS	2.00
1	223-0440060	SCR 4-40X0.375 BND SL SS	4.00
1	240-020000	WSH/ILK .095X.185X.013 S	2.00
1	240-040000	WSH/ILK .123X.265X.015 S	4.00
1	248-025600	NUT/HEX 2-56 .187 .062 S	2.00
1	248-044000	NUT/HEX 4-40 .250 .093 S	4.00
1	201-221900	RES/22.1 1% 1/8W	17.00

310 I/O ONLY PENTHOUSE FRONT PANEL

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	617-932710	310IO ONLY FRT PAN BD	
1	000-932701	PCB/310 DISK DRIVE FT PAN	1.00
1	022-722500	DIO/LDG HLMP1540 1.6V R HP	1.00
1	024-795300	CON/ 26M HR SO DUAL/ST AP	1.00
1	024-865400	CON/ 5F HR SO S ESS105TT/	6.00
1	025-739600	SW/PB 1P1TM MDP AU05 IE	1.00
1	025-748500	SW/PB 1P1TM SMK/LENS	1.00
1	163-703000	DISPLAY/7 SEGMENT HDSP-7801 G	3.00

310 SINGLE DRIVE PENTHOUSE FRONT PANEL

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	617-932720	310 SINGLE DRIVE	
1	000-932701	PCB/310 DISK DRIVE FT PAN	1.00
1	022-716500	DIO/LDR CMD571 .07W 2V R GN	1.00
1	022-722500	DIO/LDG HLMP1540 1.6V R HP	4.00
1	024-795300	CON/ 26M HR SO DUAL/ST AP	1.00
1	024-865400	CON/ 5F HR SO S ESS105TT/	7.00
1	025-739200	SW/PB 1P1TM BLK	3.00
1	025-739600	SW/PB 1P1TM MDP AU05 IE	2.00
1	025-748500	SW/PB 1P1TM SMK/LENS	4.00
1	163-703000	DISPLAY/7 SEGMENT HDSP-7801 G	3.00

310 DUAL DRIVE PENTHOUSE FRONT PANEL

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	617-932700	310 DUAL FRT PAN BD	
1	000-932701	PCB/310 DISK DRIVE FT PAN	1.00
1	022-716500	DIO/LDR CMD571 .07W 2V R GN	1.00
1	022-722500	DIO/LDG HLMP1540 1.6V R HP	4.00
1	024-795300	CON/ 26M HR SO DUAL/ST AP	1.00
1	024-865400	CON/ 5F HR SO S ESS105TT/	7.00
1	025-739200	SW/PB 1P1TM BLK	4.00
1	025-739600	SW/PB 1P1TM MDP AU05 IE	2.00
1	025-748500	SW/PB 1P1TM SMK/LENS	4.00
1	163-703000	DISPLAY/7 SEGMENT HDSP-7801 G	3.00

310 I/O ONLY PENTHOUSE FRAME ASSEMBLY

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)		QUANTITY (Each)
	847-310IO	310 I/O OPTION		
1	011-918801	BRACKET/310 OVERLAY SUPPORT		1.00
1	011-921500	BRKT/310 HUMP SUPPORT		1.00
1	042-908102	COVER/310A,B,C TOP COVER	Y	1.00
1	042-908801	COVER/310IO TOP LID N/DR	Y	1.00
1	051-702600	FOOT/757-R LAVELLE		1.00
1	068-915401	OVERLAY/310 IO ONLY		1.00
1	085-918800	CBL/26 COND 4 HDR/HDR		1.00
1	177-002500	IBMPC PROG 5 1/4 DISK		1.00
*2	270-702500	DISK/2SÍD2DEN MINI BLANK 5 1/		1.00
1	260-1063208	STOF SWA 6-32X1/2 .250	S	6.00
1	617-932710	310IO ONLY FRONT PANEL BOARD		1.00
1	617-937000	310 IO BOARD ASSY		1.00

310 SINGLE DRIVE PENTHOUSE FRAME ASSEMBLY

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)			QUANTITY (Each)
	847-310SD	310 SINGLE DRIVE			
1	011-918801	BRACKET/310 OVERLAY SUPPORT			1.00
1	011-921500	BRKT/310 HUMP SUPPORT			1.00
1	042-908102	COVER/310A,B,C TOP COVER		Y	1.00
1	042-909801	COVER/310SD TOP LID 5 1/4"		Y	1.00
1	046-708000	GRM/ 3/8 X 5/32 X 1/4			4.00
1	051-702600	FOOT/757-R LAVELLE			1.00
1	068-915301	OVERLAY/310 SINGLE DRIVE			1.00
1	085-918800	CBL/26 COND 4 HDR/HDR			1.00
1	085-919400	CBL/34 COND 12" HDR/EDG			1.00
1	177-002500	IBMPC PROG 5 1/4 DISK			1.00
*2	270-702500	DISK/2SID2DEN MINI BLANK 5 1/			1.00
1	222-068200	P.E./DISK DRIVE 5.25" FLP FD5			1.00
1	232-M30500	SCR SHO SLOTTED HEAD(9X15M030			4.00
1	260-1063208	STOF SWA 6-32X1/2 .250		S	6.00
1	270-709800	310SD FORMAT. DATA DISK. 5 1/			1.00
*2	270-702500	DISK/2SID2DEN MINI BLANK 5 1/			1.00
1	407-002000	CBL 310 DISK DRIVE PWR 5.25			1.00
*2	015-702301	PIN F 20-14GA 61117-1	AM		4.00
*2	024-703600	CON/ 4F RC CP 1-480424	AM		1.00
*2	024-882100	CON/ 4F/RC ID S 640440-4	AM	N	1.00
*2	042-753700	COVER/ 4F REC 640550-4	AM	N	1.00
1	617-932720	310SINGLE DRIVE FRT PAN BOARD			1.00
1	617-937000	310 IO BOARD ASSY			1.00

310 DUAL DRIVE PENTHOUSE FRAME ASSEMBLY

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	847-310DD	310 DUAL DRIVE	
1	011-918801	BRACKET/310 OVERLAY SUPPORT	1.00
1	011-921500	BRKT/310 HUMP SUPPORT	1.00
1	042-908001	COVER/310DD TOP LID 2 DISK DR	1.00
1	042-908102	COVER/310A,B,C TOP COVER	1.00
1	046-708000	GRM/ 3/8 X 5/32 X 1/4	8.00
1	051-702600	FOOT/757-R LAVELLE	1.00
1	068-915101	OVERLAY/310 DUAL DRIVE	1.00
1	085-918800	CBL/26 COND 4 HDR/HDR	1.00
1	085-919000	CBL/4 COND 6" HDR/HDR (PWR CB	2.00
1	085-919500	CBL/30 COND 12" HDR/HDR/HDR	1.00
1	177-002600	310 IBM SAMPLE PROGRAM 3 1/2	1.00
*2	270-707200	DISK/FLOPPY 3.5" DSDD 10/BOX	0.10
1	222-050100	P.E./DISK DRIVE 3 1/2 DSDD 13	2.00
1	232-M30500	SCR SHO SLOTTED HEAD(9X15M030	8.00
1	260-1063208	STOF SWA 6-32X1/2 .250 S	6.00
1	270-709900	310DD FORMAT. DATA DISK. 3 1/	2.00
*2	270-707200	DISK/FLOPPY 3.5" DSDD 10/BOX	0.10
1	617-932700	310 DUAL DRIVE FRT PAN BOARD	1.00
1	617-937000	310 IO BOARD ASSY	1.00

RACK MOUNT WITHOUT I/O PENTHOUSE

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	847-310RMS	RACKMOUNT WITHOUT OPTIONS	
1	049-703400	HANDLE/7/16 X 9/32 OVAL BLACK	2.00
1	093-704500	FASTNR/SCR/WSH 8-32X.500 BL	4.00
1	129-902900	FRAME/310 RACKMOUNT 7"	1.00

RACK MOUNT WITH I/O PENTHOUSE

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	847-310RM	RACKMOUNT	
1	049-703400	HANDLE/7/16 X 9/32 OVAL BLACK	2.00
1	093-704500	FASTNR/SCR/WSH 8-32X.500 BL	6.00
1	129-902101	FRAME/310 RACK/WITH OPTIONS Y	1.00

POWER SUPPLY ASSEMBLY

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
	617-939600	PWR DISTRIBUTION BOARD	
1	000-939600	PCB/310 POWER SUPPLY WIRING B Y	1.00
1	024-733200	CON/ 6M HR SO 9-350259 AM	3.00
1	024-881400	CON/ 10F/HR SO S 26-16-5100	1.00
1	061-709900	TERM/M	1.00

OLD ADC WITH MOD BOARD

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
		310 ADC/MOD BOARD	
1	025-744600	SW/TO 2P2T A-23KV NK	2.00
1	025-745700	SW/RO 3P9PS 1802PREL-18-3 S	2.00
1	085-907900	CBL/COAX 6" HDR/HDR CHABIN	2.00
1	273-1800XXX	WIRE/SOLID 18 GA NON INSULATE	1.00
1	273-18626XX	WIRE/STRD 18GA BLU N/	0.50
1	273-18627XX	WIRE/STRD 18GA VIO N/	0.50
1	417-935500	3091 ADC BD (LESS MOD BD)	1.00
*2	021-702200	TRN/NPN 2N3903 1W 40V C MO	5.00
*2	022-700800	OBL/1N4004 400V USE:022-73850	1.00
*2	022-714100	DIO/SCT HSCH1001 .9W 60V HP	2.00
*2	023-700300	CAP/ /500P 500 J MI A	1.00
*2	023-700400	CAP/ /47P 500 J MI A	4.00
*2	023-702400	CAP/ /.01M 100 M CE A	1.00
*2	023-711200	CAP/ /220M 10 K TA A	1.00
*2	023-711300	CAP/ /.1M 250 K PE R	1.00
*2	023-715500	CAP/VA/1.5-.25P 1000 TF O	4.00
*2	023-716400	CAP/ /12P 300 D MI R	7.00
*2	023-717300	CAP/ /68P 300 D MI R	4.00
*2	023-717700	CAP/ /4P 300 D MI R	2.00
*2	023-717800	CAP/ /6P 300 JB MI R	2.00
*2	023-717900	CAP/ /8P 300 JA MI R	1.00
*2	023-718200	CAP /27P 300 J MI R	1.00
*2	023-726300	CAP/ /22M 35 K TA R	2.00
*2	023-726400	CAP/ /4.7M 10 K TA R	5.00
*2	023-726600	CAP/ /6.8M 35 K TA R	4.00
*2	023-738400	CAP/ /.022M 400 K PE R	4.00
*2	023-763500	CAP/ /47P 500 J MI A	4.00
*2	024-733200	CON/ 6M HR SO 9-350259 AM	1.00
*2	024-739500	CON/ 5M HR SO 2210-2051 MO	1.00
*2	024-739600	CON/ 10M HR SO	1.00
*2	024-743100	CON/ 8F DP SO 641260-3 AM	2.00
*2	024-759900	CON/ 1F HR SO SS-120-T-2 SAM	4.00
*2	024-769100	CON/ 16M HR SO 2210-2161 MO	1.00
*2	024-773100	CON/ 1F HR SO 226287-2 AM	4.00
*2	024-798600	CON/ 50M HR SO D/ST APT	1.00
*2	024-808200	CON/ 20M HR SO S AP	1.00
*2	024-812500	CON 14M HDR/SOL D/ST A	1.00
*2	024-813400	CON/ 2M HR SO 22102021 MOL	2.00
*2	025-739700	SW/TH 1P1T08 76PSB08S GR	1.00
*2	025-744800	SW/RO 1P26PS 1760SMPREL S	3.00
*2	026-710400	POT/ 100 A .5W 3299W1101 BR	2.00

OLD ADC WITH MOD BOARD (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
*2	026-712000	POT/ 1K A .5W 3299W1102 BR	2.00
*2	026-712100	POT/ 10K A .5W 3299W1103 BR	4.00
*2	026-713200	POT/ 500 A .5W 3299W1501 BR	4.00
*2	026-715500	POT/1K10K D 625-8739 CL	2.00
*2	070-703400	FUSE/.75 A/276.750 LITTLEFUSE	1.00
*2	070-706000	FUSE/1A 256001 PICO II	1.00
*2	070-706100	FUSE/5A 256005 PICO II	2.00
*2	070-707900	FUSE/2A 256002 PICO II	1.00
*2	085-902500	CBL/34 PCB/HDR 3091 ADC SY	1.00
*2	085-907900	CBL/COAX 6" HDR/HDR CHABIN	2.00
*2	100-702400	RNET/I/ 330 10P 9R P 2	1.00
*2	100-900100	RNET/I/ATTENUAT 5P R .1	4.00
*2	106-704700	RES/30K 5% 2W NON-IND	4.00
*2	106-714200	RES/MATCH 1% 1-4K,1-8K 1-16	2.00
*2	121-703900	REG +12V .5A LM341P-12 E NA	2.00
*2	121-704000	REG -12V .5A LM79M12CP E NA	2.00
*2	134-763000	IC/27GZ P D GEN PURPO	2.00
*2	134-768800	IC/CPU/8253 P D TIMER PRO	1.00
*2	260-1060004	STOF SWA #6 1/4 .250 SS	2.00
*2	260-1063204	STOF SWA 6-32X1/4 .250 SS	4.00
*2	000-935500	OBS/01 PCB/3091 ADC WITH MOD	1.00
*2	000-935501	PCB/3091 ADC WITH MOD BD Y	1.00
*2	022-719800	DIO/TFR 1N4152 .5W 30V A FC	36.00
*2	022-738500	DIO RECT 1N4004 400V 1A G	1.00
*2	023-747000	CAP/ /.047M 50 Z EP A	40.00
*2	134-712800	IC/74LS00 DIG P D NAND-2	3.00
*2	134-713200	IC/74LS74 DIG P D F/F DUAL	10.00
*2	134-716000	IC/74S86 DIG P D XOR-2	1.00
*2	134-718000	IC/74LS194 DIG P D REG SHI 4	1.00
*2	134-718800	IC/74LS175 DIG P D F/F QUAD	1.00
*2	134-719400	IC/TTL/74LS151 P D MUX 8-1	1.00
*2	134-720400	IC/74LS02 DIG P D NOR-2	3.00
*2	134-723800	IC/74LS169 DIG P D COUN BI U	6.00
*2	134-730600	IC/3140 LIN P D GEN PURPO	10.00
*2	134-732900	IC/74LS32 DIG P D OR-2	1.00
*2	134-736800	IC/74LS374 DIG P D F/F OCT D	2.00
*2	134-739100	IC/TTL/74LS244 P D BUFF TRI	2.00
*2	134-745000	IC/74S133 DIG P D NAND-13	1.00
*2	134-769500	IC/74LS125 DIG P D BUFF TRI	1.00
*2	134-794900	IC/356 LIN P D JFET	2.00
*2	201-100000	RES/100 1% 1/8W	8.00
*2	201-100100	RES/1K 1% 1/8W	7.00
*2	201-100200	RES/10K 1% 1/8W	7.00
*2	201-105200	RES/10.5K 1% 1/8W	2.00

OLD ADC WITH MOD BOARD (Cont.)

RELATIVE LEVEL	COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
*2	201-221000	RES/221 1% 1/8W	2.00
*2	201-221100	RES/2.21K 1% 1/8W	4.00
*2	201-249100	RES/2.49K 1% 1/8W	2.00
*2	201-249200	RES/24.9K 1% 1/8W	6.00
*2	201-249300	RES/249K 1% 1/8W	2.00
*2	201-332000	RES/332 1% 1/8W	2.00
*2	201-332100	RES/3.32K 1% 1/8W	4.00
*2	201-453000	RES/453 1% 1/8W	2.00
*2	201-475100	RES/4.75K 1% 1/8W	10.00
*2	201-475900	RES/47.5 1% 1/8W	3.00
*2	201-487000	RES/487 1% 1/8W	2.00
*2	201-499000	RES/499 1% 1/8W	4.00
*2	201-511100	RES/5.11K 1% 1/8W	4.00
*2	201-590100	RES/5.9K 1% 1/8W	2.00
*2	201-619100	RES/6.19K 1% 1/8W	1.00
*2	201-806100	RES/8.06K 1% 1/8W	2.00
*2	201-825100	RES/8.25K 1% 1/8W	2.00
1	617-933500	3091 ADC MOD BD	1.00
*2	000-933501	PCB/3091 ADC MOD BD	1.00
*2	000-933502	PCB/3091 ADC MOD BD	1.00
*2	019-709400	INDUCT/360 UH @ 100 MA BIAS	2.00
*2	023-717400	CAP/ /.1M 50 M CE R	32.00
*2	023-721000	CAP/ /100M 16 M TA A	23.00
*2	023-726600	CAP/ /6.8M 35 K TA R	2.00
*2	024-798500	CON/ 26M HR SO D/ST APT	1.00
*2	024-813400	CON/ 2M HR SO 22102021 MOL	2.00
*2	100-701700	RNET/I/ 220/330 10P 16R T 5	2.00
*2	134-712900	IC/TTL/74LS04 P D INV HEX	1.00
*2	134-772500	IC/TTL/74ALS574 P D F/F OCT D	4.00
*2	134-791200	IC/TTL/74ALS576 P D F/F OCT D	2.00
*2	134-878800	IC/9003 INT P D 12B 1MHZ	2.00
*2	201-100200	RES/10K 1% 1/8W	1.00

OLD 3091 SCOPE FRAME ASSEMBLY

RELATIVE LEVEL		COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
		887-3091	3091 UNIT ASSEMBLY	
1		044-913800	SHIELD/310 PROCESSOR FRONT	1.00
1		051-700300	BUMPER/SJ-5018 1/4" BLACK MM	1.00
1		085-718300	PROBE/X1 COLINE 906-90-604	2.00
1		258-1060004	SPCR NT #6X1/4" .250 NY	3.00
1		269-900600	MANUAL 3091 OPERATING	1.00
1		467-000100	3091 REAR PNL ASSY (4100 P.S.	1.00
*2		000-912401	5/2/88 PCB/3091 REAR PANEL SW	1.00
*2		000-915203	5/2/88 PCB/3091 PWR SUPPLY HA	1.00
*2		023-729800	5/2/88 CAP/ /.33M 250 M PA R	1.00
*2		024-779100	CON/ 2F SU ID CEI00F24-2 P	1.00
*2		025-743100	5/2/88 SW/RK 2P1T 260011E ARH	1.00
*2		025-746300	5/2/88 SW/SL 4P2T GF-1142 CW	1.00
*2		070-706900	5/2/88 FUSE/2AMP 3AG NORMAL-B	1.00
*2		071-726800	5/2/88 HOLDER/FUSE 102071	2.00
*2		201-100400	RES/1M 1% 1/8W	1.00
*2		407-000300	3091 10" POWER SUPPLY CABLE	1.00
**3		015-706401	PIN F 18-26GA 350665-1 TIN AM	6.00
**3		024-726900	CON/ 6F RC CP 1-350241 AM	1.00
*2		407-000400	3091 13" POWER SUPPLY CABLE	1.00
**3		015-706401	PIN F 18-26GA 350665-1 TIN AM	6.00
**3		024-726900	CON/ 6F RC CP 1-350241 AM	1.00
*2	1200	044-902105	5/2/88 SHIELD/3091 POWER SUPP	1.00
*2	1200	046-703800	GRM/ID .125 OD .343	4.00
*2	1200	051-700700	BUMPER/SJ-5017	1.00
*2	1200	051-701900	BUMPER/SJ-5008 1/8" BLACK MM	2.00
*2	1200	068-902607	5/2/88 PAN/3091 REAR	1.00
*2	1200	068-903307	5/2/88 PAN 3091 REAR OVERLAY	1.00
*2	1200	072-702400	FAN/12V DC BRUSH	1.00
*2	1200	113-706300	PWR SUP/+5+-15V 4100-4A PWRGE	1.00
*2	1400	258-0060006	SPCR NT #6 X 3/8 .250 AL	2.00
*2	1400	259-2063206	SPCR TP 6-32X3/8 .250 SS	2.00
*2	1600	024-721400	CON/ 1F CL SO 31-010 AP	3.00
*2	1600	040-900003	FOOT/3091 CORD WRAP W/SPACER	4.00
**3		258-0060060	SPCR NT #6 X 3/8 .250 AL	1.00
*2	1600	042-901100	5/2/88 COVER/3091 110/220 SWI	1.00
*2	1600	060-703600	POST/BINDING 7/16" #110 HH	1.00
*2	1600	063-702600	RELIEF/STRAIN LINE CHORD	1.00
*2	1600	085-715900	CORD A/C 6FT BLACK	1.00
*2	1600	085-903701	CBL/10 COND 6" 3091 PEN BNC	1.00
*2	1600	114-705300	5/2/88 FLTR/EMI 2VB1 2AMP CR	1.00

OLD 3091 SCOPE FRAME ASSEMBLY (Cont.)

RELATIVE LEVEL		COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
1		467-000200	3091 W/O BUBBLE FILLER ASSY	1.00
*2	1800	002-900303	PLATE/3091 CASSETTE COVER	1.00
*2	1800	002-900703	PLATE/3091 CASSETTE INSERT	1.00
*2	1800	116-723300	SUPP/1-1/8" NYLON TCBS-18R RP	2.00
1		477-000100	3091/310 FRAME MECH. ASSY.	1.00
*2		040-901000	CLIP/310 HANDLE BOLT RETAINER	2.00
*2		044-903704	SHIELD/310 CRT	1.00
*2		045-712400	KNOB/CR-30 1/4-20	2.00
*2		049-900104	HANDLE/310	1.00
**3		049-900302	HANDLE/3091 MACHND & PRETREAT	1.00
***4		112-900601	EXTRUSION/3091	1.00
*2		268-902900	MOUNTING SCREW-3091 HANDLE	2.00
*2		407-002600	CBL/310 CRT ANODE ASSEMBLY	1.00
**3		024-712000	CON/ 1M CRT ANODE	1.00
*2	1200	002-900501	PLATE/3091 EXTRUSION MOUNTING	2.00
*2	1200	004-900000	BUSH/3091 HANDLE	2.00
*2	1200	011-902405	BRKT/3091 CRT	1.00
*2	1200	017-716500	LABEL/SERIAL NUMBER	1.00
*2	1200	027-700800	CRT/140-DEB31 5" CURVED FACE	1.00
*2	1200	034-900602	RAIL/3091 SIDE	2.00
**3		112-900401	EXTRUSION/SIDE RAIL(310 & 800	16.00
*2	1200	051-701900	BUMPER/SJ-5008 1/8" BLACK MM	4.00
*2	1200	051-703500	BUMPER/SJ-5003 MM	1.00
*2	1200	129-900402	FRAME/3091 END CASTING	1.00
1		477-000900	3091 FINALING KIT	1.00
*2		042-900705	COVER/3091 TOP	1.00
*2		042-900906	COVER/3091/310 BOTTOM	1.00
*2	1100	051-702600	FOOT/757-R LAVELLE	4.00
*2	1800	032-702500	INSUL/#6 SCREW 1/4" RP	1.00
*2	1800	045-705200	KNOB/KU-401B 1/8 AL	1.00
*2	1800	093-704000	FASTNR/PRESS 1/2"X11/64" BLK	4.00
*2	1800	117-702400	BAG/3091 POUCH	1.00
1		477-001700	BEZEL/GRATICULE ASSEMBLY	1.00
*2		164-700502	GRAT/BLUE	1.00
*2	1800	268-703001	BEZEL/CRT FRONT PANEL	1.00
1		617-933400	310 PROCESSOR BD ASSY	1.00
*2		407-002102	CBL/310 CRT 13 COND	1.00
**3		085-715801	CBL/12 COND CRT SPECIAL BUY	1.00
1		667-000100	MOV/3091 FRONT PANEL ASSEMBLY	1.00
*2		011-903000	4/4/88 BRKT/3091 ADC TO SHIEL	4.00
*2		044-902602	SHIELD/3091 ADC :	1.00
*2		085-916800	CBL/ 50 COND 9" HDR/HDR/HDR	1.00
*2		259-0063218	SPCR TP 6-32X1 1/8 .250 SS	1.00
*2		259-0063232	SPCR TP 6-32X2.000 .250 AL	1.00

OLD 3091 SCOPE FRAME ASSEMBLY (Cont.)

RELATIVE LEVEL		COMPONENT ITEM NO.	DESCRIPTION (Truncated)	QUANTITY (Each)
*2		260-1063216	STOF SWA 6-32X1 .250 S	1.00
*2		407-002700	CBL ASSY/PRE-TRIGGER SWITCH	1.00
*2		417-933200	310 CURSOR BD ASSY (PAL=6)	1.00
*2		617-000300	310/3091 TRIGGER BD ASSY	1.00
*2		617-935500	4/4/88 310 ADC BD (WITH MOD B	1.00
*2	1200	002-901400	PLATE/3091 TAB	1.00
*2	1200	024-721400	CON/ 1F CL SO 31-010 AP	5.00
*2	1200	025-746000	SW/PP 1P1T 19-289.0 GREEN EAO	1.00
*2	1200	025-746100	SW/MO 1P1TM 19-159.0 RED EA	1.00
*2	1200	025-746200	SW/MO 1P1TM 19-159.0 GREEN EA	1.00
*2	1200	068-903105	OBS/9144 PAN/3091 FRONT PAN	1.00
*2	1200	068-903209	PAN/3091 FRONT SUB	1.00
*2	1200	085-902200	CBL/8 COND TIME/PT. SWITCH SY	1.00
*2	1600	024-764200	CON/ 1F HR SO 026-1800 SEL	1.00
*2	1600	035-704800	BUTT/AT467K BLACK .370" NK	12.00
*2	1600	045-712100	KNOB/.7" BLACK KLN-700B-1/4	2.00
*2	1600	045-712200	KNOB/.5" BLACK KLN-500B-1/8	3.00
*2	1600	045-712300	KNOB/.9" BLACK KLN-900B-1/4	3.00
*2	1600	085-903602	OBS/CBL/COAX 5.5" RG-6	4.00

DIAGRAMS & COMPONENT PLACEMENTS		
DESCRIPTION	**REFERENCE**	**PAGE**
Power Supply Wiring	166-9124-01 & 03	12-3
310 I/O Board†	166-937003 (1 of 7)	12-5
310 I/O Board†	166-937003 (2 of 7)	12-7
310 I/O Board†	166-937003 (3 of 7)	12-9
310 I/O Board†	166-937003 (4 of 7)	12-11
310 I/O Board†	166-937003 (5 of 7)	12-13
310 I/O Board†	166-937003 (6 of 7)	12-15
310 I/O Board†	166-937003 (7 of 7)	12-17
Processor Boad	166-933405 (1 of 4)	12-19
Processor Board (Memory Circuit)	166-933405 (2 of 4)	12-21
Processor Board (Clock Circuit)	166-933405 (3 of 4)	12-23
Processor Board (High Voltage)	166-933405 (4 of 4)	12-25
ADC Board*	166-935501 (1 of 3)*	12-27
ADC Board (Sweep Control Circuit)*	166-935501 (2 of 3)*	12-29
ADC Board (Front Panel Circuit)*	166-935501 (3 of 3)*	12-31
ADC Mod Board (Digital Multiplexer)*	166-933502*	12-33
Trigger Board	166-912106	12-35
Cursor Board	166-933200	12-37
Front Panel Board	166-932702	12-39
Front Panel Circuit Overview	xxx-xxxx-xx	12-40
Rear Panel Wiring Diagram	166-939600B	12-41
ADC Board**	166-941301 (1 of 10)**	12-43
ADC Board**	166-941301 (2 of 10)**	12-45
ADC Board**	166-941301 (3 of 10)**	12-47
ADC Board**	166-941301 (4 of 10)**	12-49
ADC Board**	166-941301 (5 of 10)**	12-51
ADC Board**	166-941301 (6 of 10)**	12-53
ADC Board**	166-941301 (7 of 10)**	12-55
ADC Board**	166-941301 (8 of 10)**	12-57
ADC Board**	166-941301 (9 of 10)**	12-59
ADC Board**	166-941301 (10 of 10)**	12-61

†The Diagrams for the I/O Board include the circuitry for the dual drive option.
*ADC Board including Mod Board.
**ADC Board without Mod Board.

TIMING CHARTS		
DESCRIPTION	**REFERENCE**	**PAGE**
Basic Timing	Timing Chart #1	12-62
Memory Timing	Timing Chart #2	12-63
ADC Timing	Timing Chart #3	12-64
Normal Cycle (No Dwell, No Refresh)	Timing Chart #4	12-65
Dwell Cycle (No Refresh)	Timing Chart #5	12-66
Refresh Cycle (No Dwell)	Timing Chart #6	12-67

NOTE: COMPONENTS CI AND RI ARE ON THE 310 POWER SUPPLY BOARD.

310 POWER SUPPLY BOARD 000-915203

EMI FILTER 114-7053-00

CI .33uf 250v

RI 1M

F1, 3A

S1 ON-OFF SWITCH

S2 110/220v SWITCH

110v

220

110/220v SWITCH BOARD 000-9124-01

T1-1 RED

T1-3 BRN

T1-2 BLUE

T1-4 BLACK

J1-C9 WHITE

POWER SUPPLY 113-7063-00

-S

±15v COM

±5vRTN

+15v

-15v

+5v

+S

BLK 3 GND

BLK 5 GND

BLK 6 GND

BLK 3 GND

BLK 5 GND

BLK 6 GND

BLK 3 GND

BLK 5 GND

BLK 6 GND

YELLOW 4 +15v

YELLOW 4 +15v

YELLOW 4 +15v

BLUE 2 -15v

BLUE 2 -15v

BLUE 2 -15v

RED +5V

RED +5 V

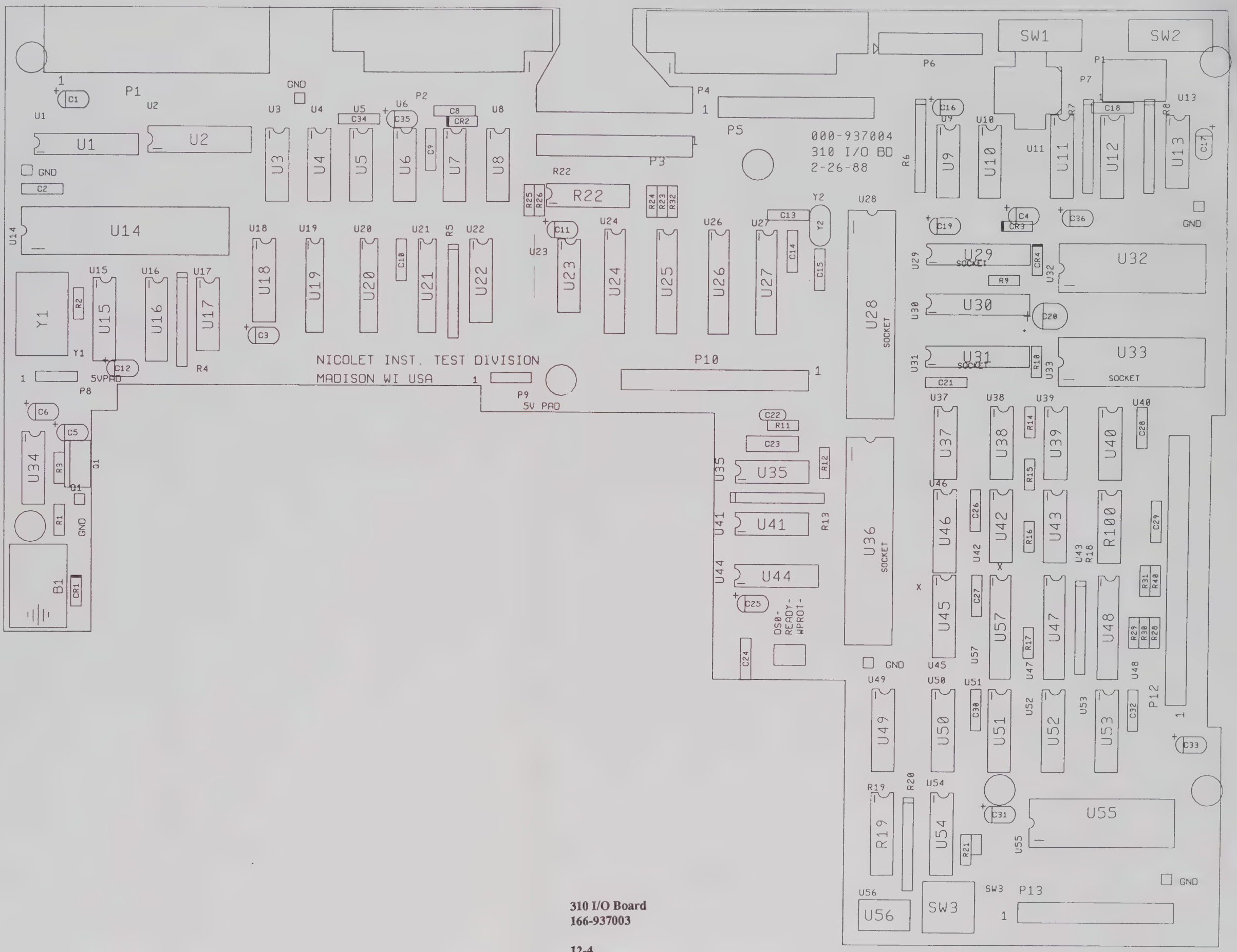
RED +5V

= I/O BD. CONNECTOR - 6 PIN

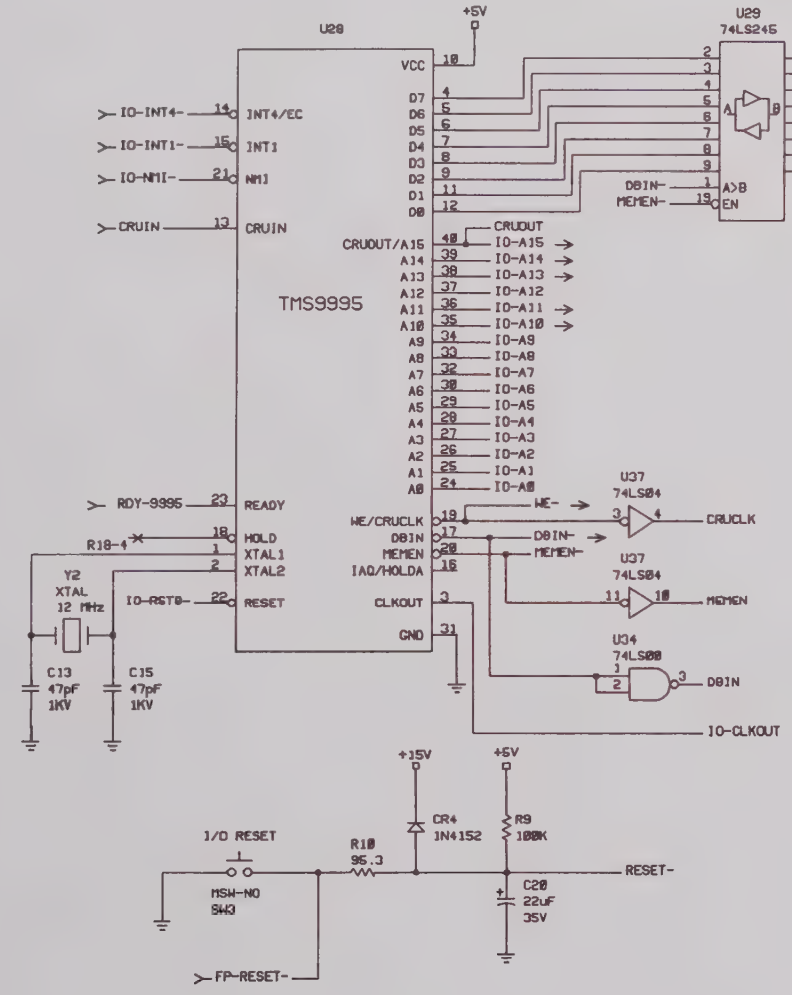
= ADC BD.

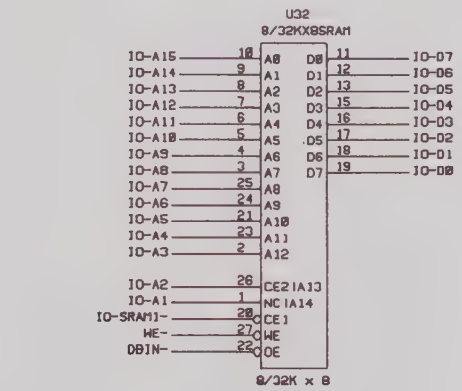
= PROCESSOR BD.

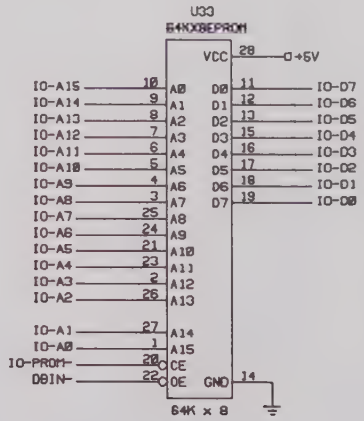
NICOLET INSTRUMENT CORP		
310 P. S. WIRING DIAGRAM		
166-9124-01 166-9152-03	MDK	11-30-82 8-6-87

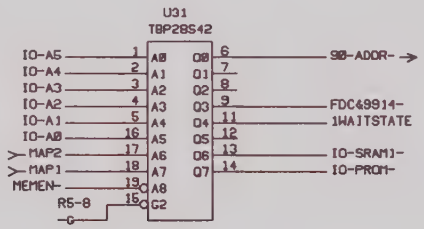


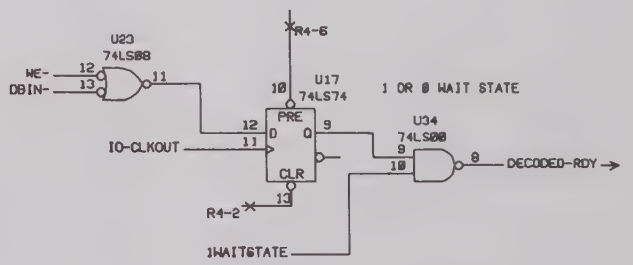
310 I/O Board
166-937003

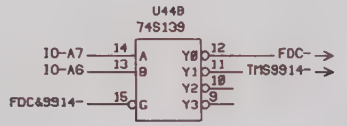


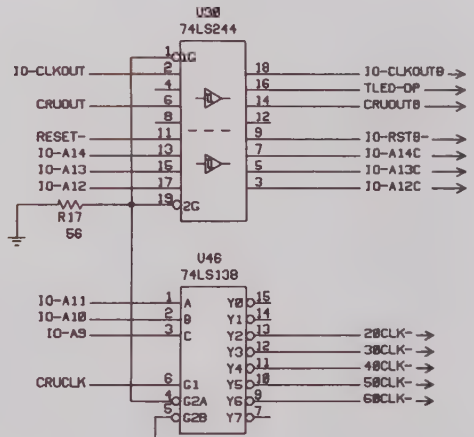






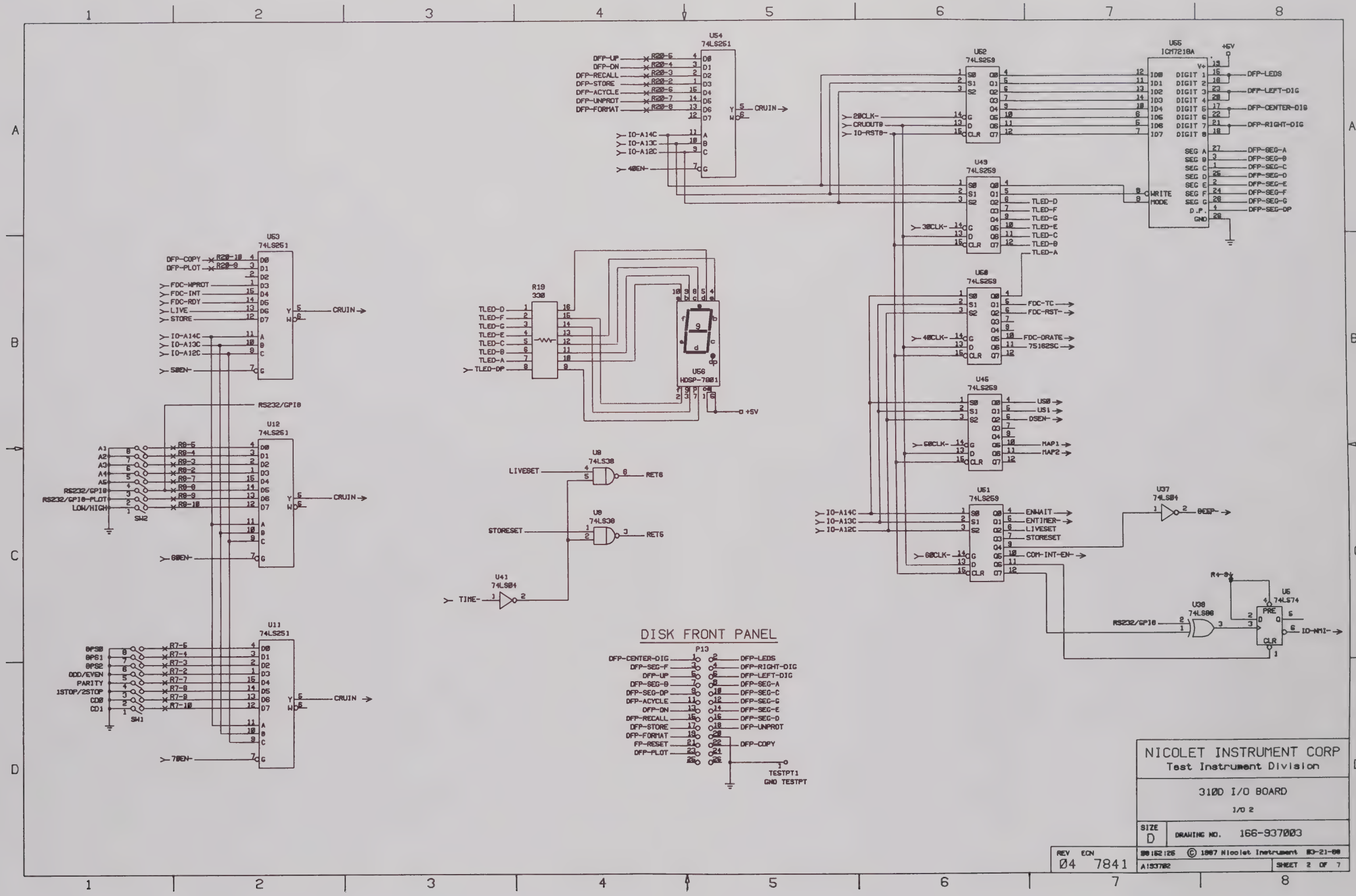


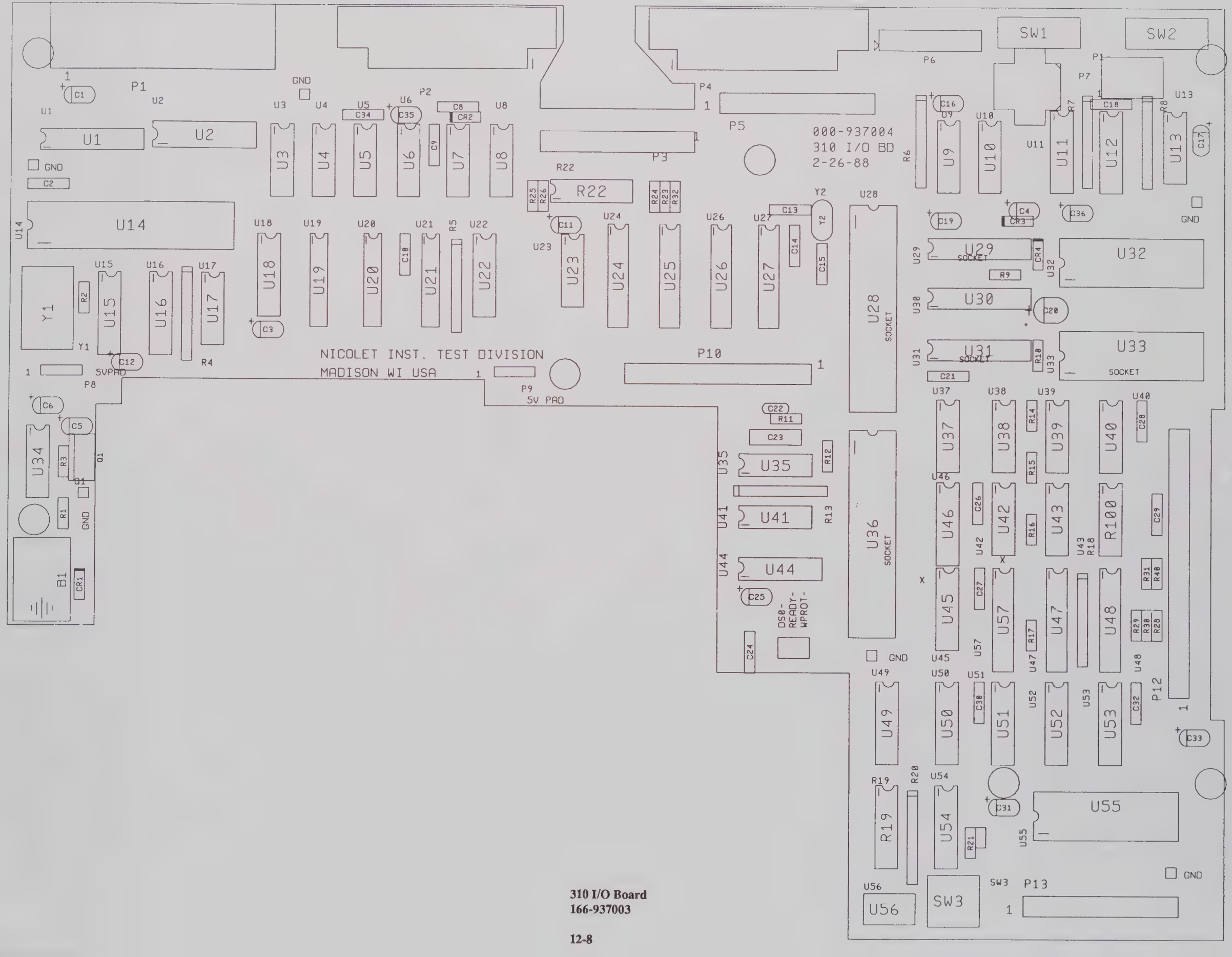




NICOLET INSTRUMENT CORP Test Instrument Division	
310D I/O BOARD I/O1	
SIZE D	DRAWING NO. 166-937003
REV 04 ECN 7841	08:48:34 © 1987 Nicolet Instrument 03-21-88
A:937I01	SHEET 1 OF 7

310 I/O Board
166-937003


U54
74LS251
DFP-UP
DFP-DN
DFP-RECALL
DFP-STORE
DFP-ACYCLE
DFP-UNPROT
DFP-FORMAT
R20-5
R20-4
R20-3
R20-2
R20-6
R20-7
R20-8
CRUIN
IO-A14C
IO-A13C
IO-A12C
40EN-
U52
74LS259
20CLK-
CRUOUT8
IO-RST8-
U55
ICM7218A
+5V
V+
DIGIT 1
DIGIT 2
DIGIT 3
DIGIT 4
DIGIT 5
DIGIT 6
DIGIT 7
DIGIT 8
DFP-LEDS
DFP-LEFT-DIG
DFP-CENTER-DIG
DFP-RIGHT-DIG
SEG A
SEG B
SEG C
SEG D
SEG E
SEG F
SEG G
D.P.
GND
DFP-SEG-A
DFP-SEG-B
DFP-SEG-C
DFP-SEG-D
DFP-SEG-E
DFP-SEG-F
DFP-SEG-G
DFP-SEG-DP
WRITE MODE
U49
74LS259
30CLK-
TLED-D
TLED-F
TLED-G
TLED-E
TLED-C
TLED-B
TLED-A
U53
74LS251
DFP-COPY
DFP-PLOT
FDC-WPROT
FDC-INT
FDC-RDY
LIVE
STORE
R20-10
R20-9
R19
330
TLED-D
TLED-F
TLED-G
TLED-E
TLED-C
TLED-B
TLED-A
TLED-DP
U56
HDSP-7801
+5V
U58
74LS259
FDC-TC
FDC-RST-
48CLK-
FDC-DRATE
75162SC
U45
74LS259
US0
US1
DSEN-
60CLK-
MAP1
MAP2
U51
74LS259
IO-A14C
IO-A13C
IO-A12C
ENWAIT
ENTIMER
LIVESET
STORESET
60CLK-
COM-INT-EN-
U37
74LS04
BEEP-
RS232/GPIB
U38
74LS08
R4-8
U5
74LS74
PRE
CLR
IO-NMI-
U8
74LS30
LIVESET
RET6
U9
74LS30
STORESET
RET6
U41
74LS04
TIME-
RS232/GPIB
RS232/GPIB-PLOT
LOW/HIGH
SW2
R8-5
R8-4
R8-3
R8-2
R8-7
R8-8
R8-9
R8-10
U12
74LS251
CRUIN
68EN-
BPS0
BPS1
BPS2
ODD/EVEN
PARITY
1STOP/2STOP
CD0
CD1
SW1
R7-5
R7-4
R7-3
R7-2
R7-7
R7-8
R7-9
R7-10
U11
74LS251
CRUIN
78EN-
DISK FRONT PANEL
P13
DFP-CENTER-DIG
DFP-SEG-F
DFP-UP
DFP-SEG-B
DFP-SEG-DP
DFP-ACYCLE
DFP-DN
DFP-RECALL
DFP-STORE
DFP-FORMAT
FP-RESET
DFP-PLOT
DFP-LEDS
DFP-RIGHT-DIG
DFP-LEFT-DIG
DFP-SEG-A
DFP-SEG-C
DFP-SEG-G
DFP-SEG-E
DFP-SEG-D
DFP-UNPROT
DFP-COPY
TESTPT1
GND TESTPT
NICOLET INSTRUMENT CORP
Test Instrument Division
3100 I/O BOARD
I/O 2
SIZE D
DRAWING NO. 166-937003
REV ECN
04 7841
A1S3702
SHEET 2 OF 7



310 I/O Board
166-937003

NOTE:DBIN IS READ EN

NOTE:JUMPER U23 PIN 3 TO +5V TO FORCE A 1 WAIT STATE

ADDRESS BUS CONN

DATA BUS CONN

NICOLET INSTRUMENT CORP Test Instrument Division	
3100 I/O BOARD I/O3	
SIZE D	DRAWING NO. 166-937003
REV ECN Ø4 7841	00158138 © 1987 Nicolet Instrument 03-21-88
A:937003	SHEET 3 OF 7

310 I/O Board
166-937003

FLOPPY DISK DRIVE

P1B

-dsk rvd
-in use
DS3-
INDEX-
DS0-
DS1-
DS2-
MOTORON-
DIR-
STEP-
WDATA-
WGATE-
TRK00-
WPROT-
RDATA-
SIDE1-
READY-

U16
74HC4040
CLR
BEEP-
4MHZ
QA QB QC QD QE QF QG QH QI QJ QK QL
R2
1B
CR1
IN4152
B1
XDUCER
STAR-PIEZO

+5V
R13
10PINSIP
330
220

U41
74LS04
FDC-WPROT
FDC-RDY
WPROT-
TRK00-
READY-
INDEX-
RDATA-

U36
DP8472
IO-D7
IO-D6
IO-D5
IO-D4
IO-D3
IO-D2
IO-D1
IO-D0
DB0 DB1 DB2 DB3 DB4 DB5 DB6 DB7
SEEK/DONE
WPROT
TRK00
STEP
DIR
READY
INDEX
WGATE
SIDE
MOTOR
DR0
DR1
RDATA
WDATA
DRATE
VCO
FILTER
PUMP-I
DWIN
FDC-INT
IO-A15
DBIN-
WE-
FDC-
INT
A0 RD WR CS
R10-5
R10-7
FDC-TC
DRQ DACK TC
FDC-DRATE
FDC-RST-
RESET
X2 ICLK X1
R12
10K
R11
499
C22
.047uF
50V
C23
.0047uF
200V

U36
74S86
STEP-
DIR-
WGATEX
WGATE-
SIDE1-
MOTORON-
WDATAX
WDATA-

+15V
Q1
LM317T
POS. REG.
I O A
C4
1uF
35V
R3
95.3
C5
6.8uF
35V
+12V
R1
825

U44A
74S139
US0
US1
DSEN-
A B G
Y0 Y1 Y2 Y3
DS0-
DS1-
DS2-
DS3-

Y1
16MHZ
XTAL OSC
+5V
4MHZ
U16
74LS191
A B C D LD D/U G
QA QB QC QD RCO M/M
R4-7
R5-10
R5-9

U57
PAL16R8
WGATE
WDATA
IN IN IN IN IN IN IN IN OE
I/O FF FF FF FF FF FF I/O
WGATEX
WDATAX

NICOLET INSTRUMENT CORP
Test Instrument Division

310D I/O BOARD

I/O 4

SIZE D
DRAWING NO. 166-937003

REV ECN
04 7841

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A:937004
SHEET 4 OF 7

310 I/O Board
166-937003

COM PORT

PLOTTER PORT

TEST PORT

GPIB 9914A

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Test Instrument Division

310D I/O BOARD

I/OS

SIZE D | DRAWING NO. 166-937003

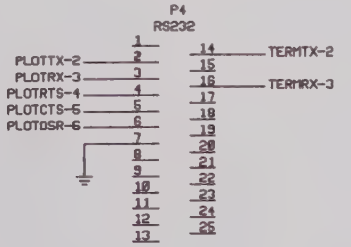
REV ECN 04 7841

08:36:34 © 1987 Nicolet Instrument 03-21-88

A:93705 | SHEET 5 OF 7

310 I/O Board
166-937003

PLOTTER CONN



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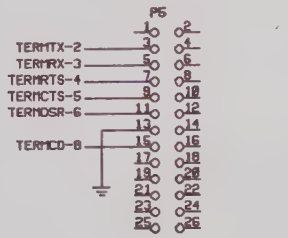
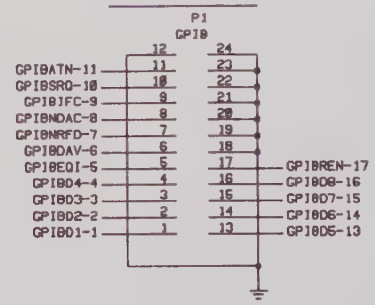
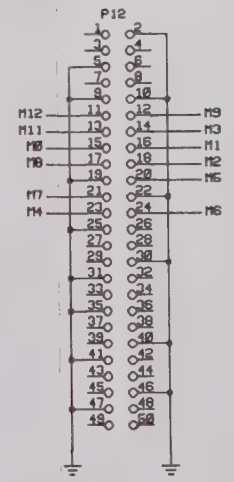


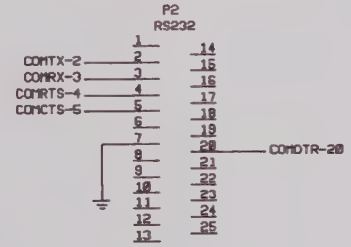
GPIB CONN



ADDRESS BUS CONN



COMPUTER CONN



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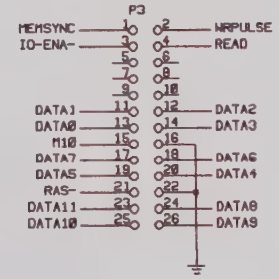
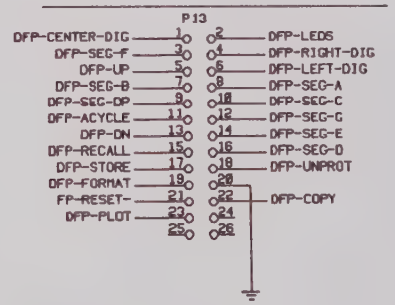
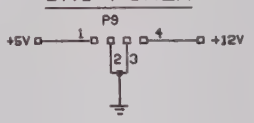


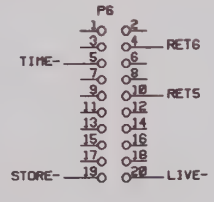
DISK FRONT PANEL CONN



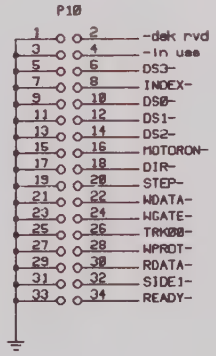
DR1 POWER



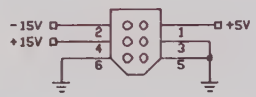
REMOTE CONTROL HEADER



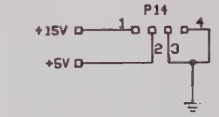
FLOPPY DISK DRIVE



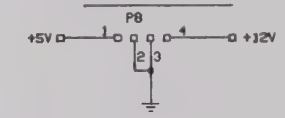
POWER CONN



BUBBLE POWER CONN



DRØ POWER



NICOLET INSTRUMENT CORP
Test Instrument Division

310D I/O BOARD

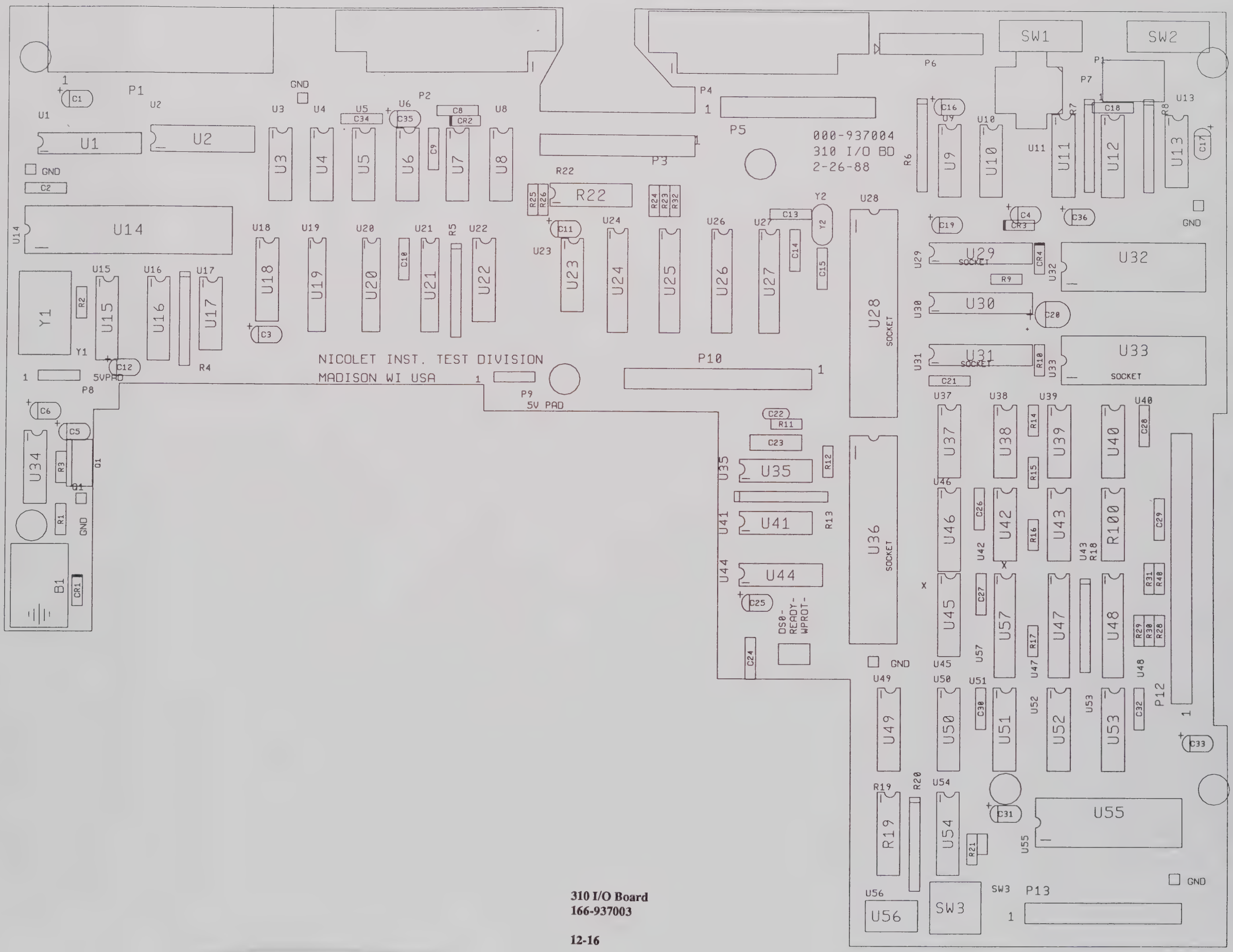
CONNECTORS

SIZE D | DRAWING NO. 166-937003

REV ECN 04 7841

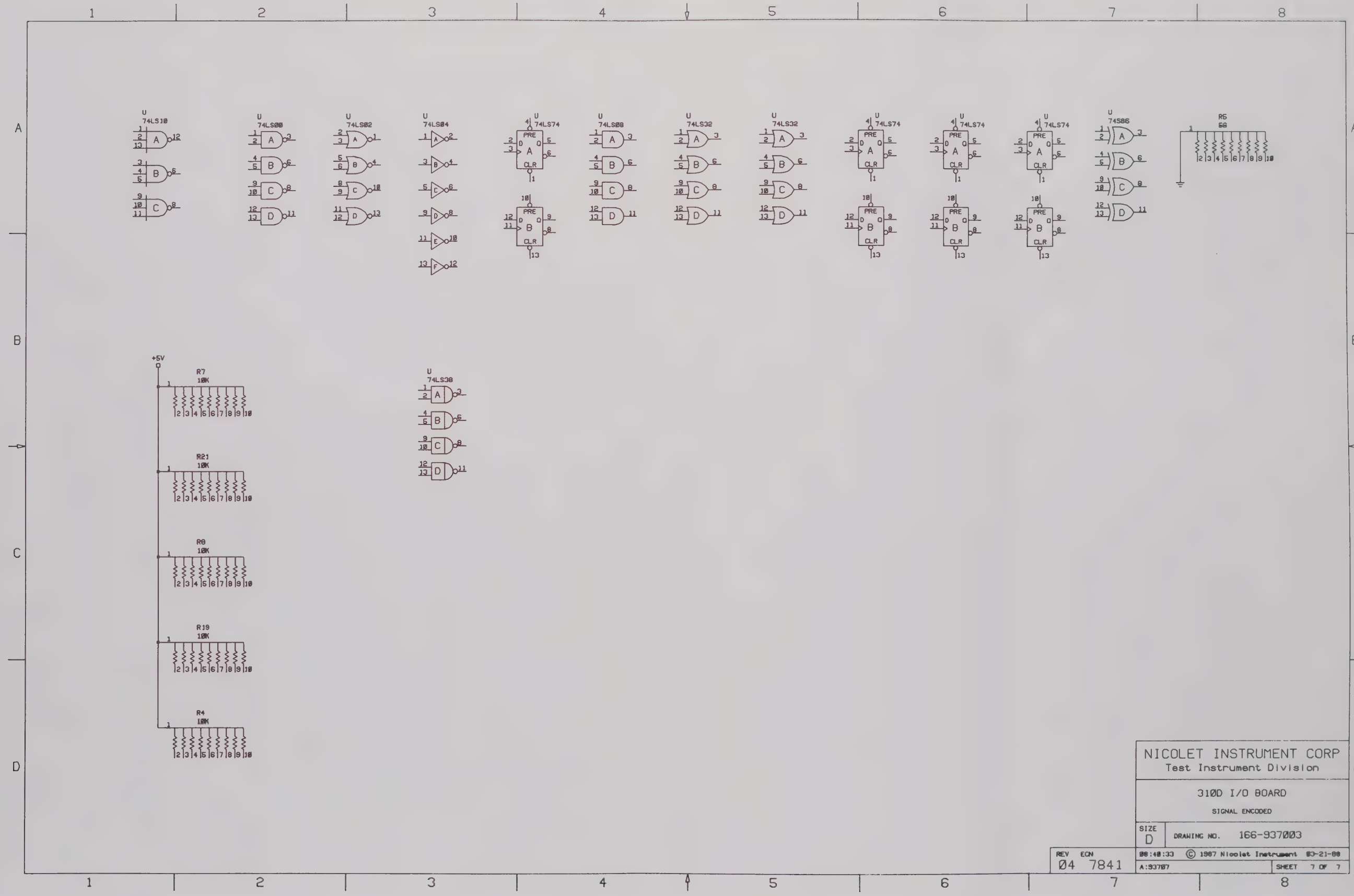
08:38:16 © 1987 Nicolet Instrument 03-21-88

A:93706 | SHEET 6 OF 7

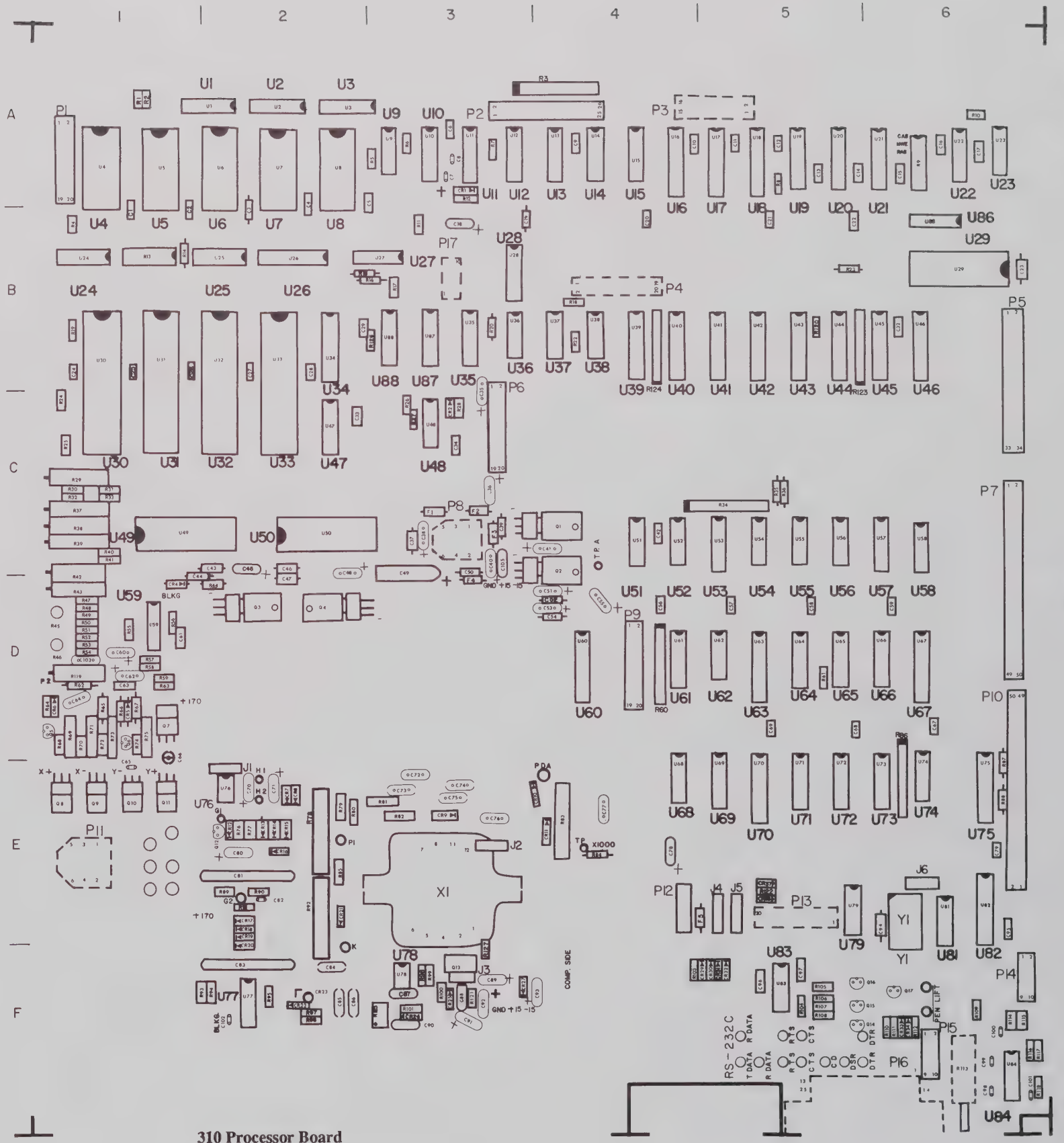


310 I/O Board
166-937003

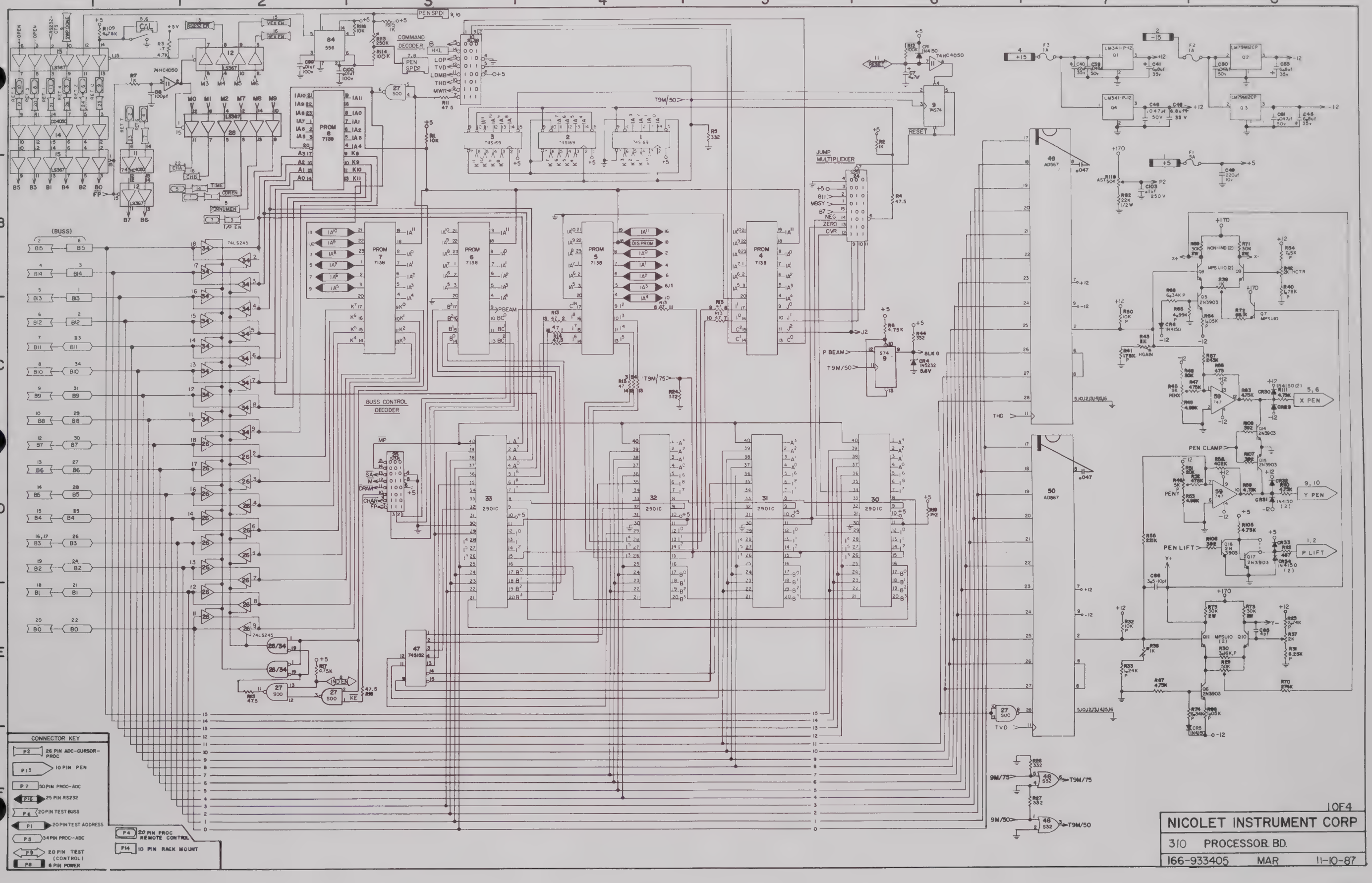
12-16

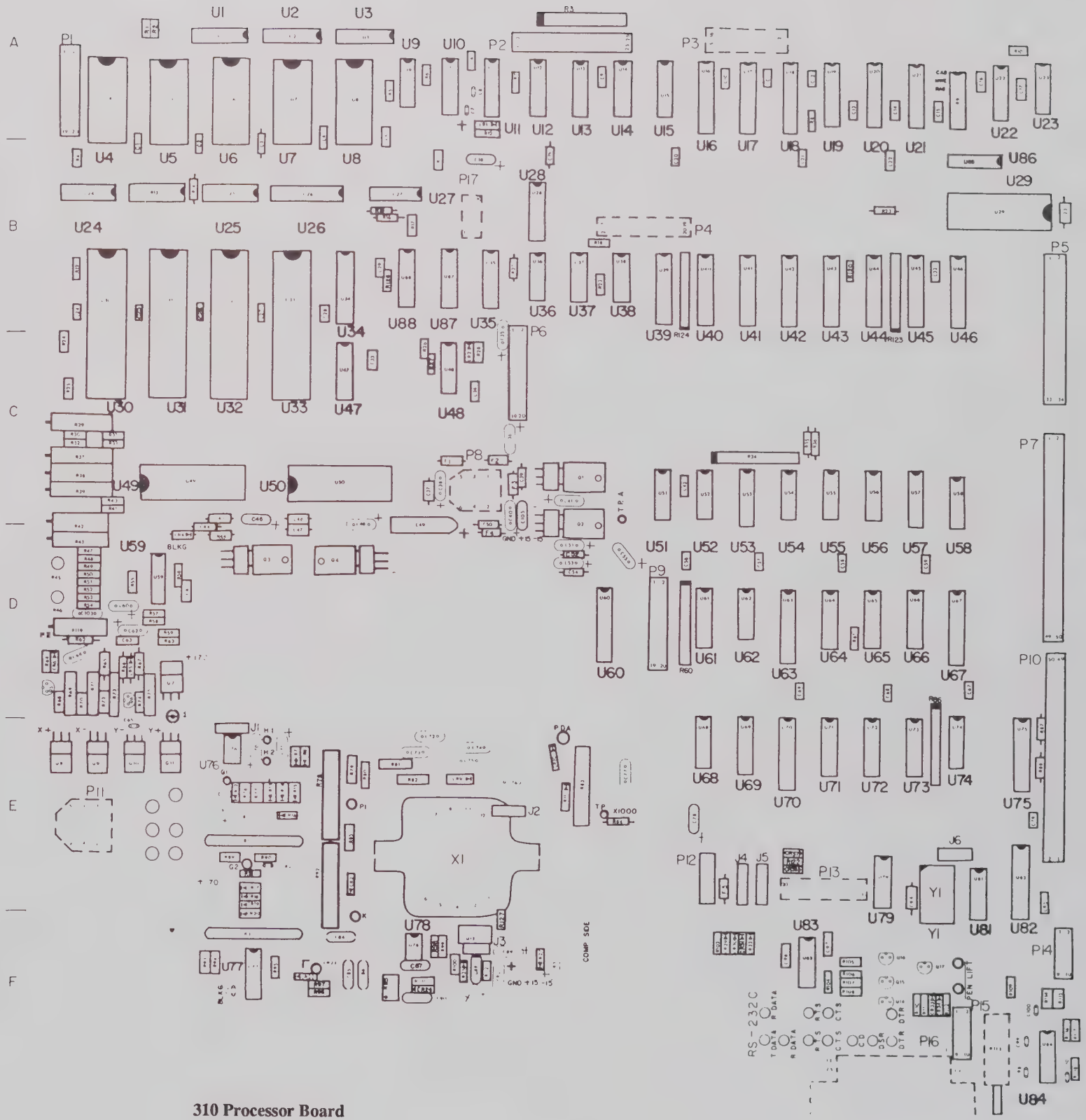


NICOLET INSTRUMENT CORP Test Instrument Division	
310D I/O BOARD SIGNAL ENCODED	
SIZE D	DRAWING NO. 166-937003
REV ECN 04 7841	08:48:33 © 1987 Nicolet Instrument 03-21-88
A:93787	SHEET 7 OF 7

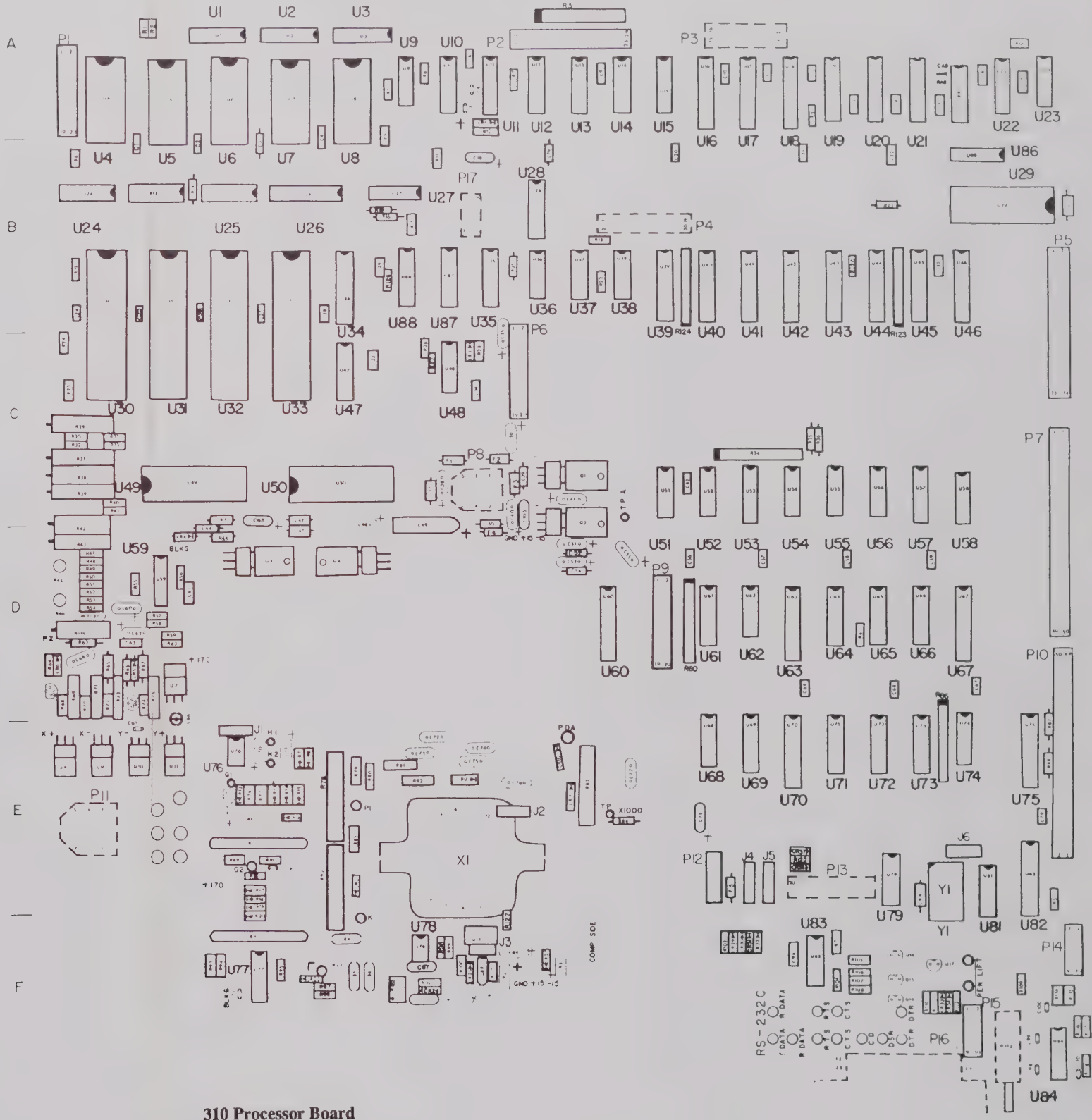


310 Processor Board
166-933405

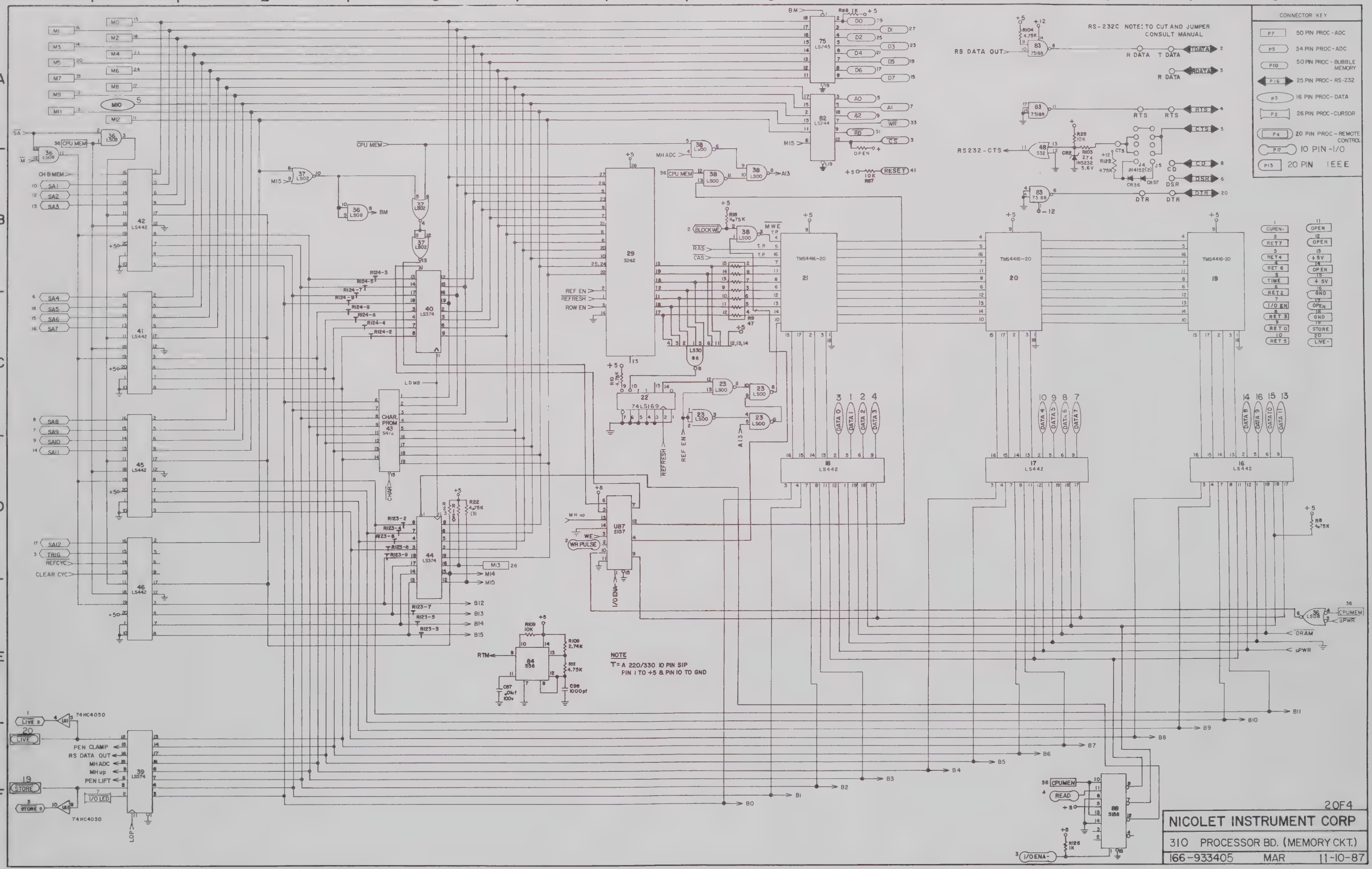

CONNECTOR KEY
P2 26 PIN ADC-CURSOR-PROC
P15 10 PIN PEN
P7 30 PIN PROC-ADC
P16 25 PIN RS232
P6 20 PIN TEST BUSS
P1 20 PIN TEST ADDRESS
P5 34 PIN PROC-ADC
P9 20 PIN TEST (CONTROL)
P8 6 PIN POWER
P4 20 PIN PROC REMOTE CONTROL
P14 10 PIN RACK MOUNT
(BUSS)
BUSS CONTROL DECODER
COMMAND DECODER
JUMP MULTIPLEXER
PROM 8 7138
PROM 7 7138
PROM 6 7138
PROM 5 7138
PROM 4 7138
DISPROM
33 2901C
32 2901C
31 2901C
30 2901C
PBEAM
T9M/50
T9M/75
RESET
INDEN
KE
THD
TVD
X PEN
Y PEN
P LIFT
PEN CLAMP
PEN LIFT
NICOLET INSTRUMENT CORP
310 PROCESSOR BD.
166-933405 MAR 11-10-87
1 OF 4

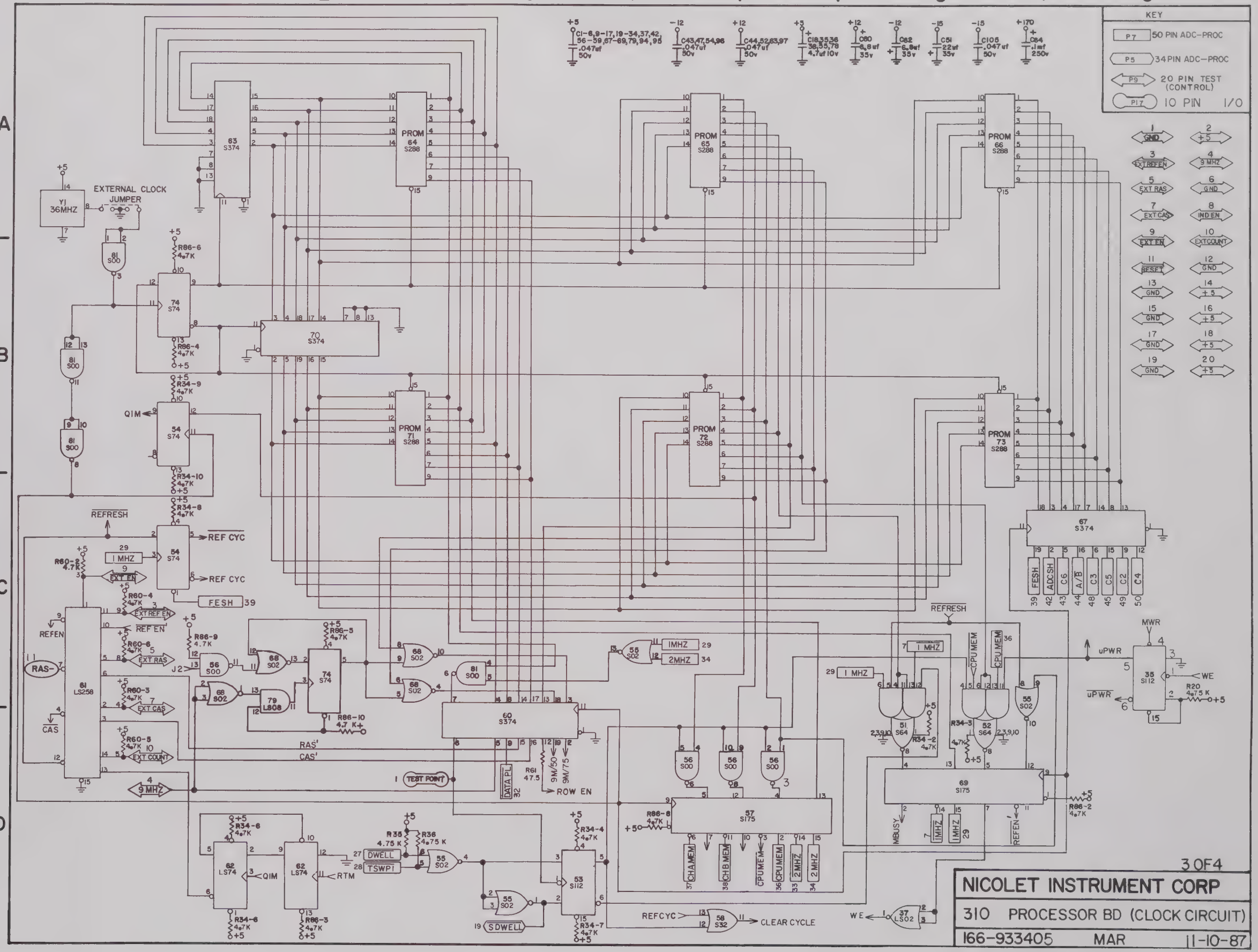


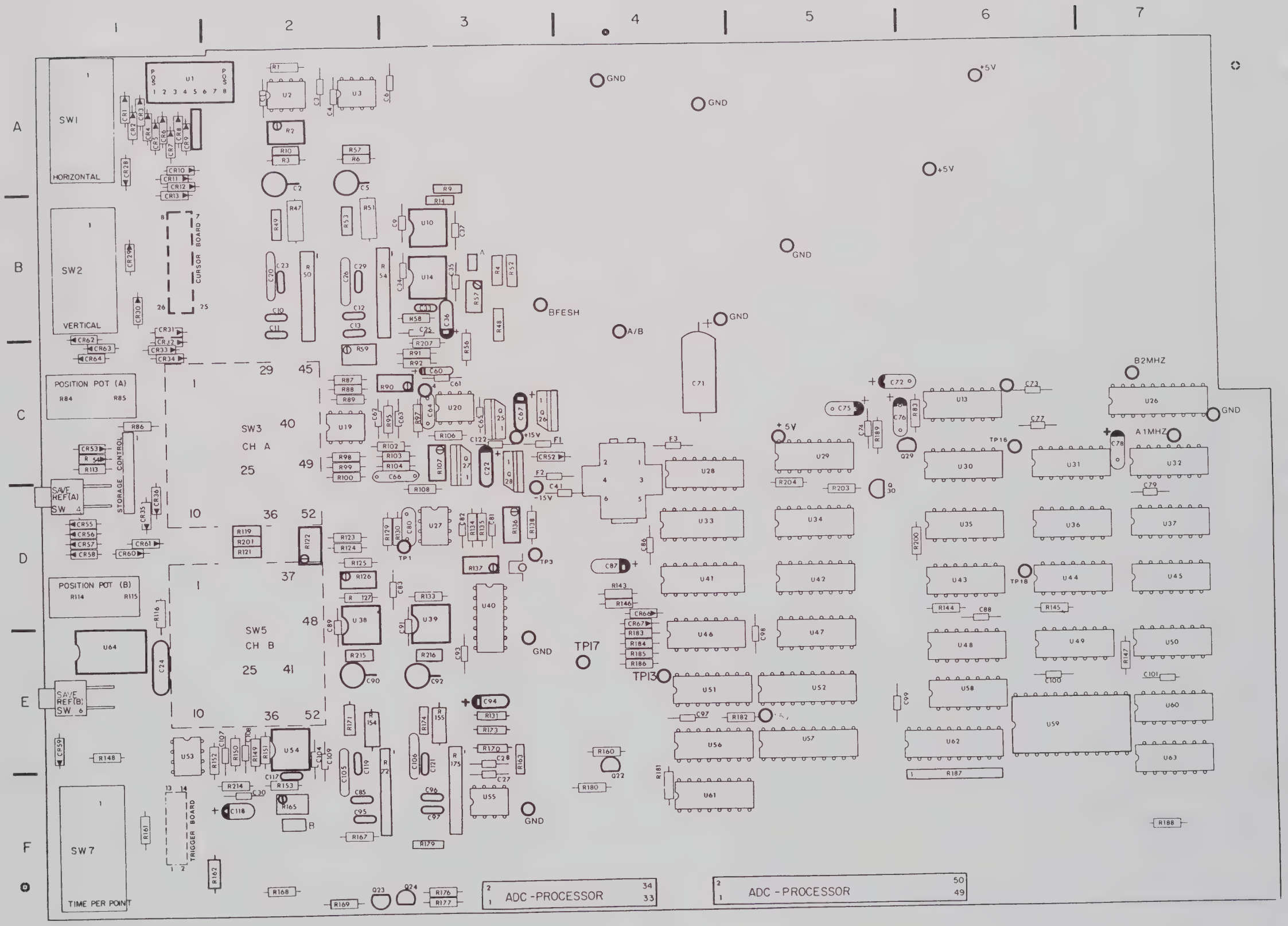
310 Processor Board
166-933405



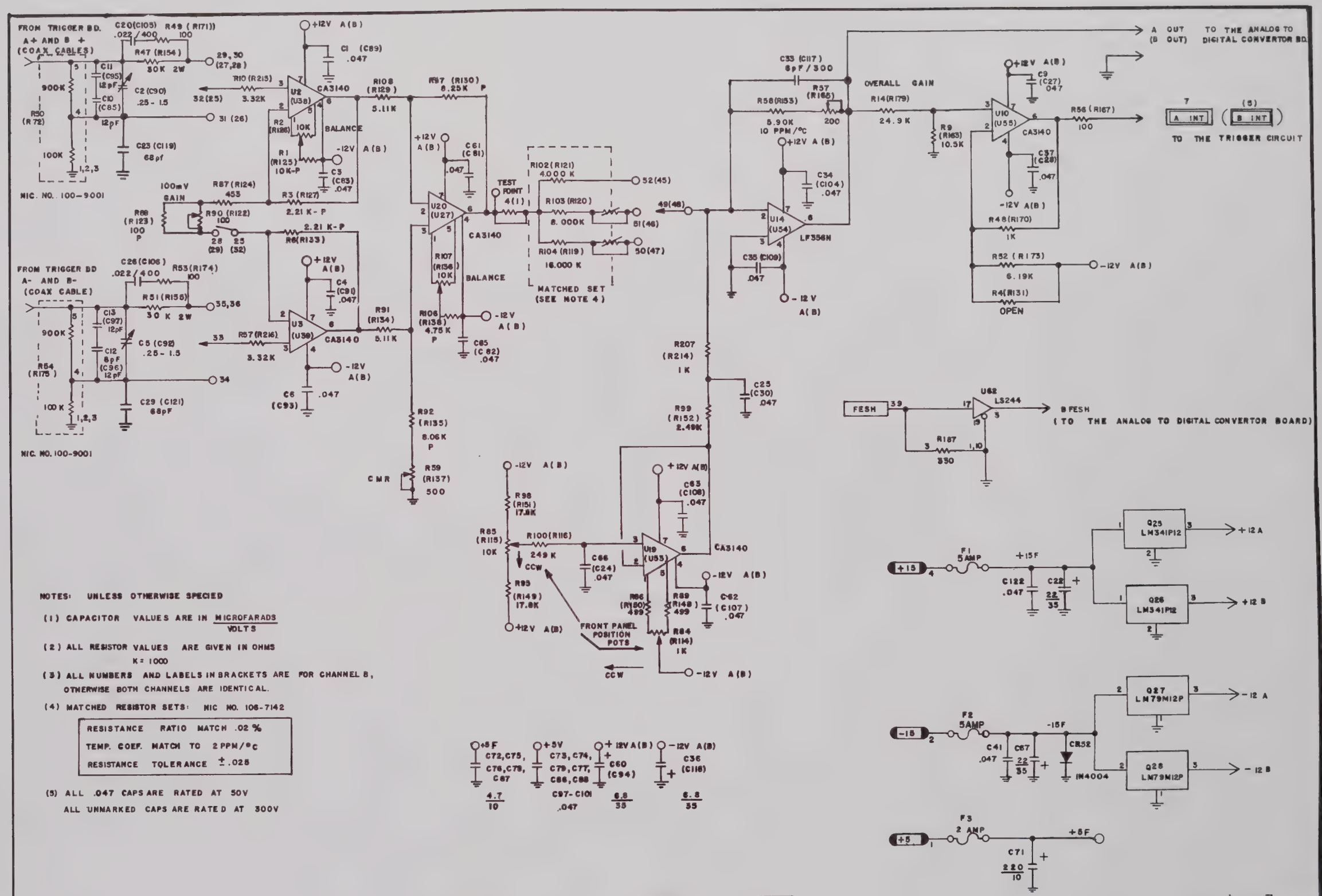
310 Processor Board
166-933405


CONNECTOR KEY
P7 50 PIN PROC - ADC
P5 34 PIN PROC - ADC
P10 50 PIN PROC - BUBBLE MEMORY
P16 25 PIN PROC - RS-232
P3 16 PIN PROC - DATA
P2 26 PIN PROC - CURSOR
P4 20 PIN PROC - REMOTE CONTROL
P17 10 PIN - I/O
P13 20 PIN IEEE
RS-232C NOTE: TO CUT AND JUMPER CONSULT MANUAL
RS DATA OUT
R DATA
T DATA
RTS
CTS
RS232 - CTS
CD
DSR
DTR
RESET
BM
MH ADC
MH up
PEN CLAMP
RS DATA OUT
PEN LIFT
REFCYC
CLEAR CYC
TRIG
LIVE
STORE
I/O LED
REFRESH
REF EN
ROW EN
BLOCK WE
RAS
CAS
CHAR PROM 43 S472
TMS4416-20
NOTE
T = A 220/330 10 PIN SIP
PIN 1 TO +5 & PIN 10 TO GND
NICOLET INSTRUMENT CORP
310 PROCESSOR BD. (MEMORY CKT.)
166-933405 MAR 11-10-87
2 OF 4


KEY
P7 50 PIN ADC-PROC
P5 34 PIN ADC-PROC
P9 20 PIN TEST (CONTROL)
P17 10 PIN I/O
EXTERNAL CLOCK JUMPER
Y1 36MHZ
PROM 64 S288
PROM 65 S288
PROM 66 S288
PROM 71 S288
PROM 72 S288
PROM 73 S288
83 S374
70 S374
60 S374
67 S374
74 S74
54 S74
62 LS74
61 LS258
81 S00
68 S02
56 S00
55 S02
79 LS08
51 S64
52 S64
69 S175
57 S175
53 S112
35 S112
37 LS02
58 S32
REFRESH
REF CYC
REF EN
EXT REF EN
EXT RAS
EXT CAS
EXT COUNT
FESH
RAS-
CAS
RAS'
CAS'
ROW EN
DATA PL
TEST POINT
DWELL
TSWP1
SDWELL
QIM
RTM
CLEAR CYCLE
1MHZ
2MHZ
CPU MEM
CH A MEM
CH B MEM
MBUSY
REFEN
uPWR
MWR
WE
3 OF 4
NICOLET INSTRUMENT CORP
310 PROCESSOR BD (CLOCK CIRCUIT)
166-933405 MAR 11-10-87



310 ADC Board
166-935501



NOTES: UNLESS OTHERWISE SPECIED

(1) CAPACITOR VALUES ARE IN MICROFARADS / VOLTS

(2) ALL RESISTOR VALUES ARE GIVEN IN OHMS
K = 1000

(3) ALL NUMBERS AND LABELS IN BRACKETS ARE FOR CHANNEL B, OTHERWISE BOTH CHANNELS ARE IDENTICAL.

(4) MATCHED RESISTOR SETS: NIC NO. 106-7142

RESISTANCE RATIO MATCH	.02 %
TEMP. COEF. MATCH TO	2 PPM/°C
RESISTANCE TOLERANCE	±.025

(5) ALL .047 CAPS ARE RATED AT 50V
ALL UNMARKED CAPS ARE RATED AT 300V

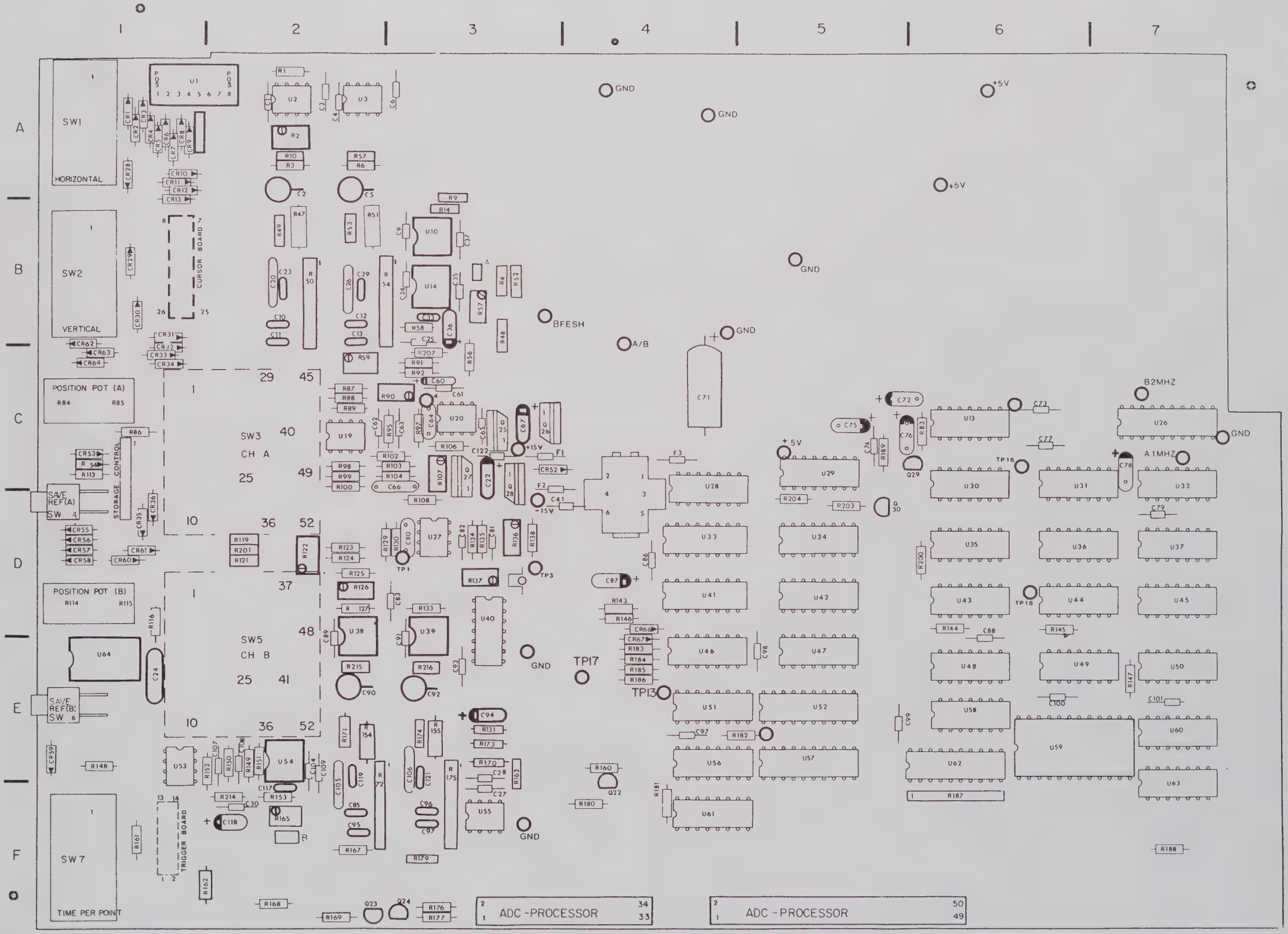
1	+5
2	-15
3	GND
4	+15
5	GND
6	GND

CONNECTOR KEY

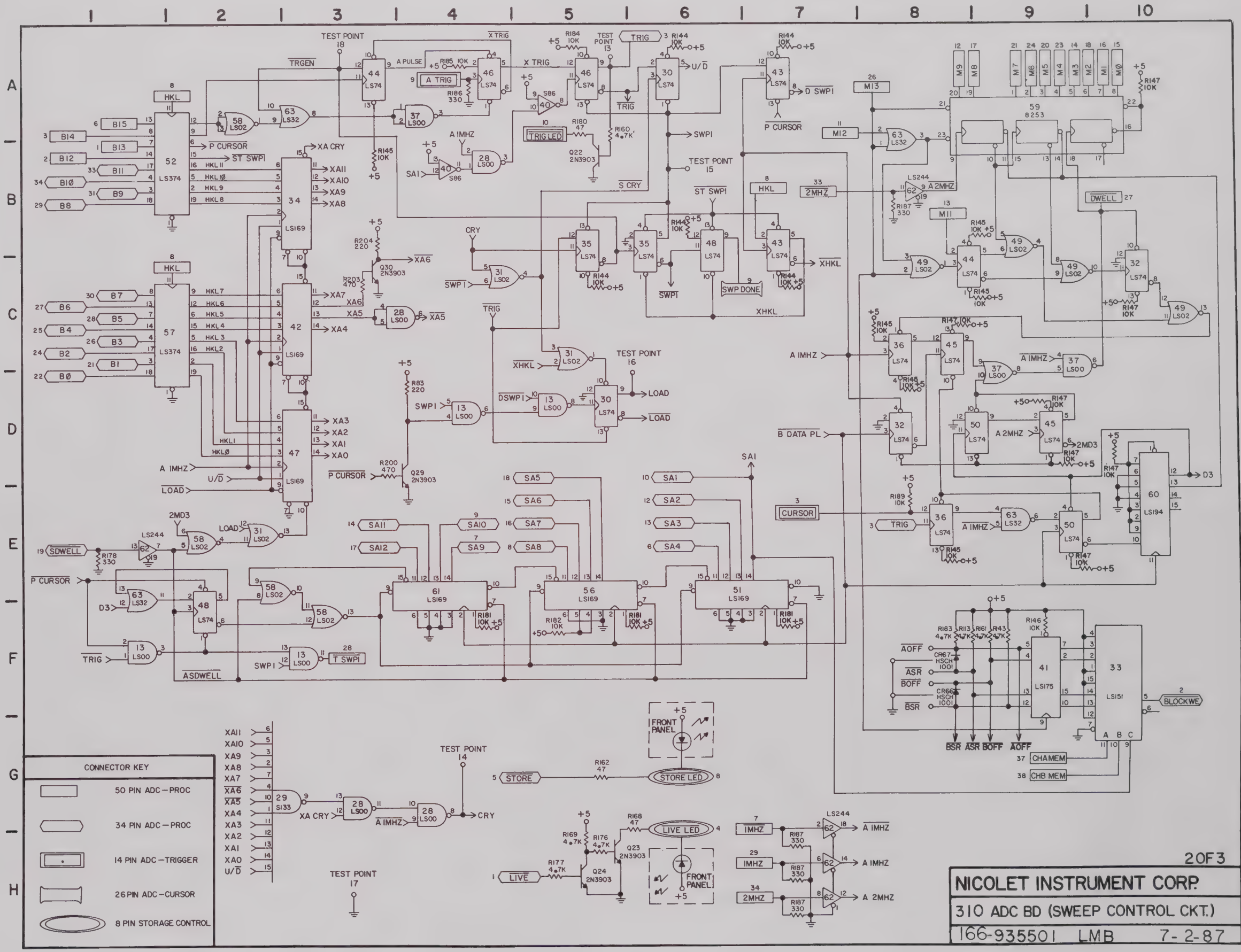
- 6 PIN POWER
- 14 PIN TRIG. - ADC
- 50 PIN ADC - PROC.

PAGE 1 OF 3

NICOLET INSTRUMENT CORP.
TEST INSTRUMENTS DIVISION
310 ADC SCHEMATIC
DATE: 6-30-87 DRWN: L.M.B.
DRWG. NO. 166-935501

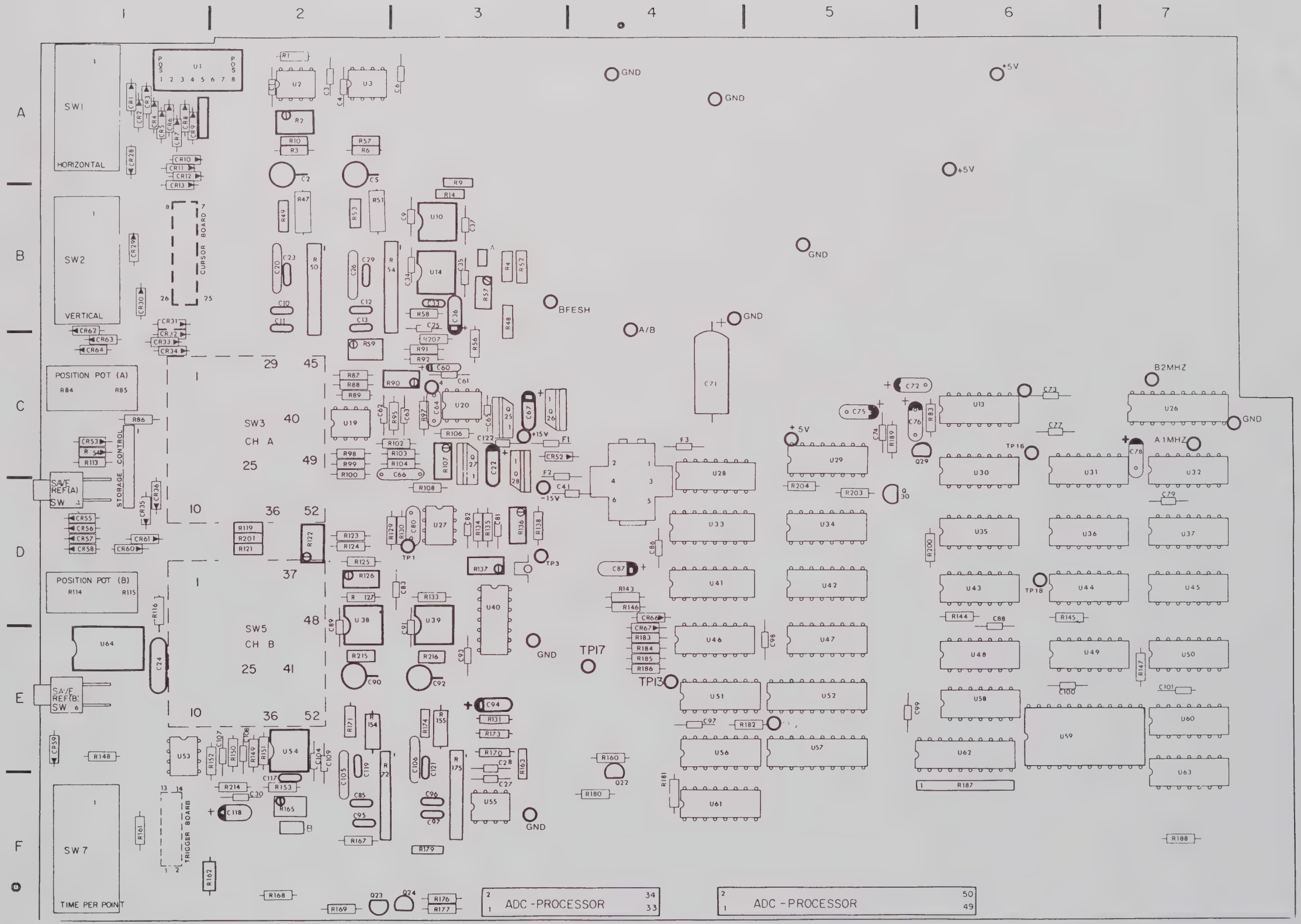


310 ADC Board
166-935501

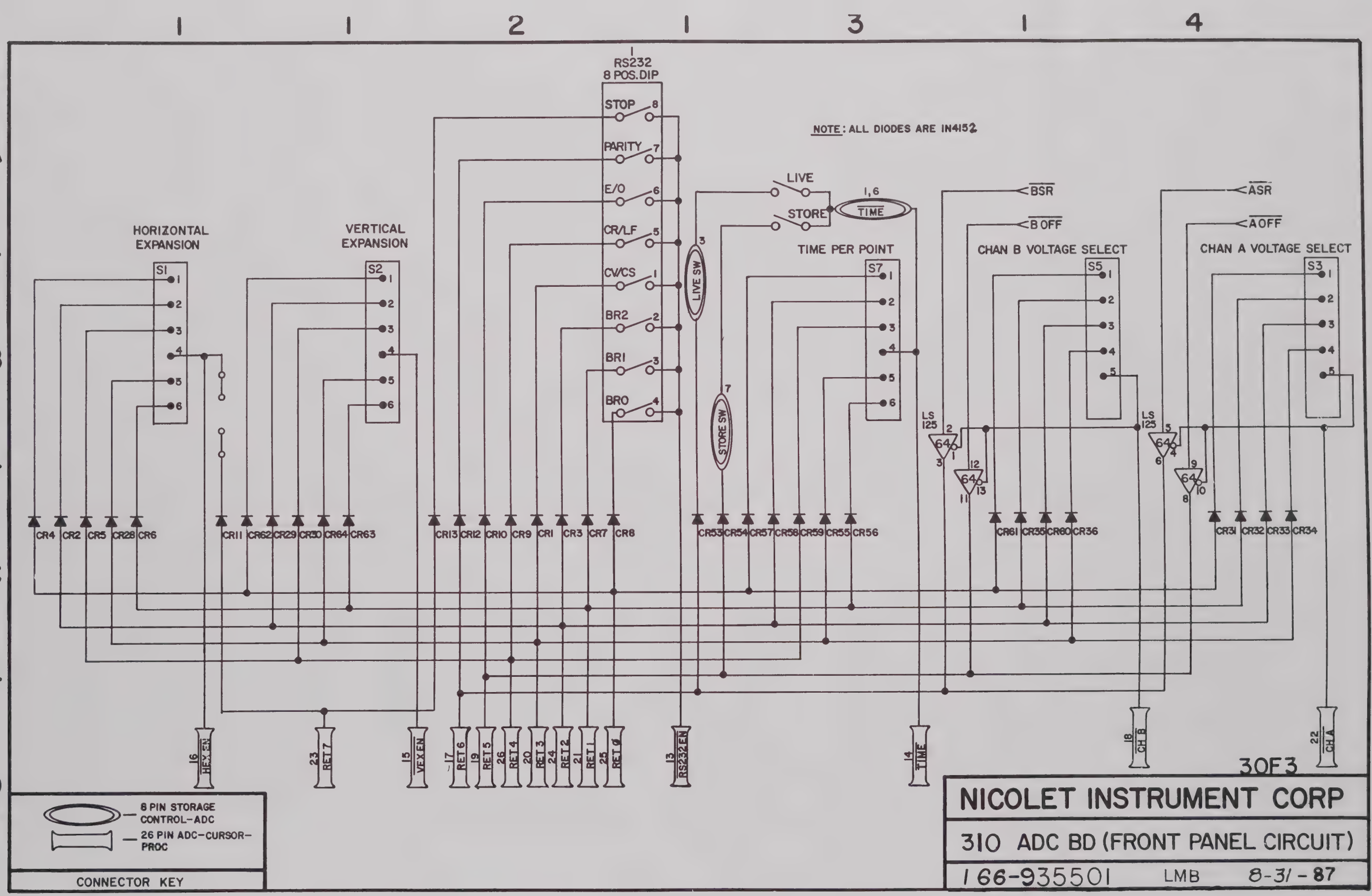


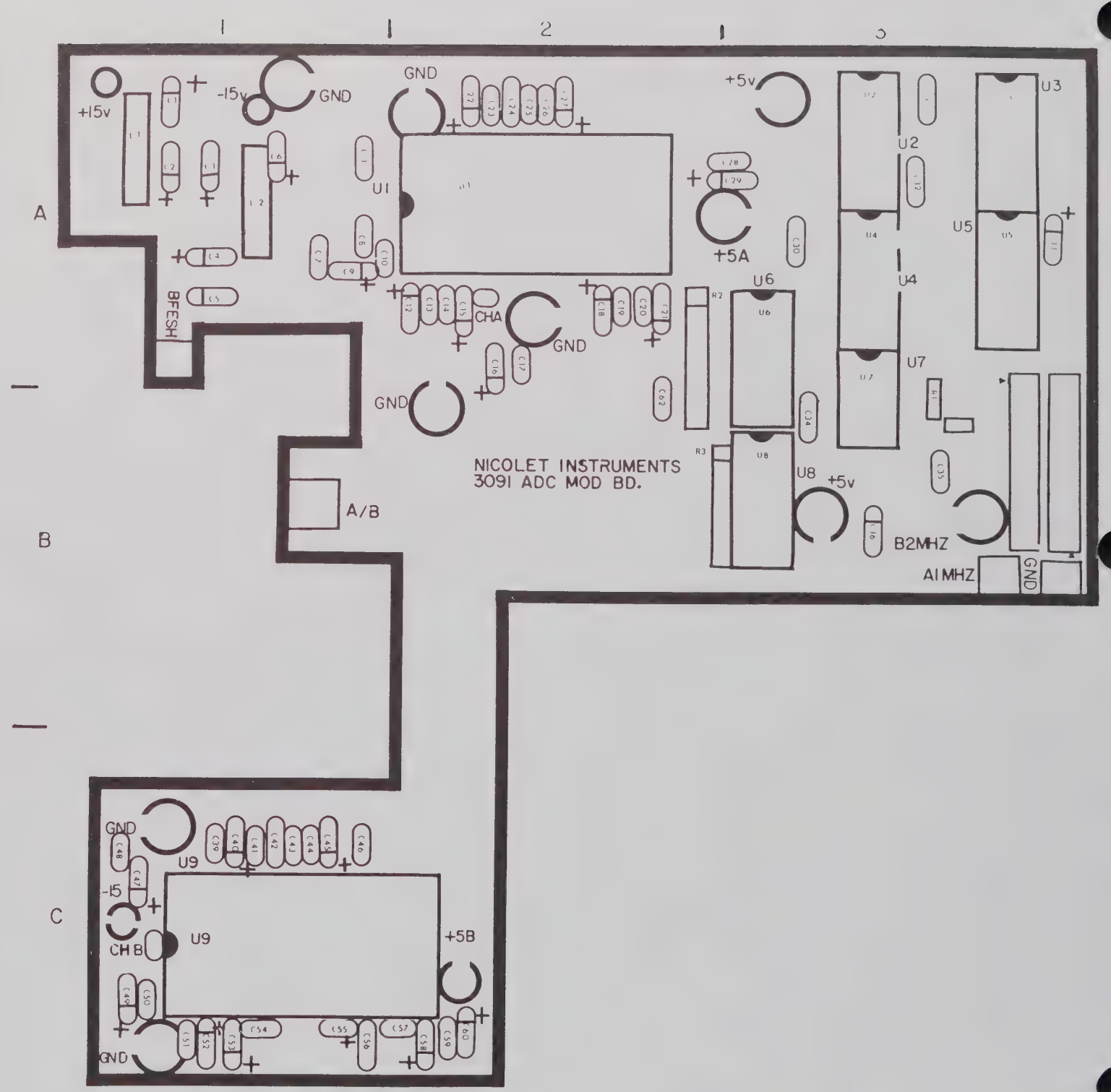
20F3

NICOLET INSTRUMENT CORP.
310 ADC BD (SWEEP CONTROL CKT.)
166-935501 LMB 7-2-87

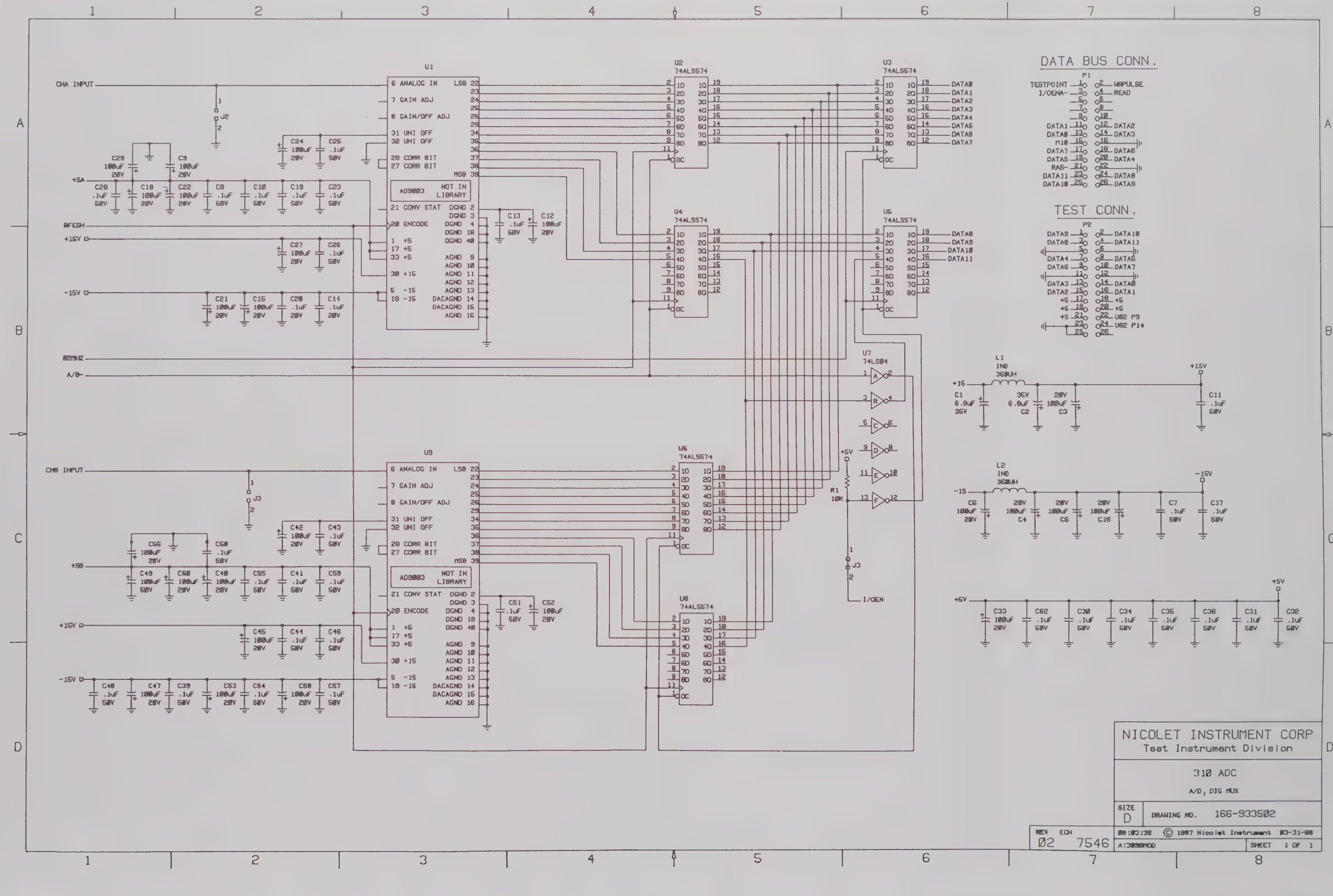


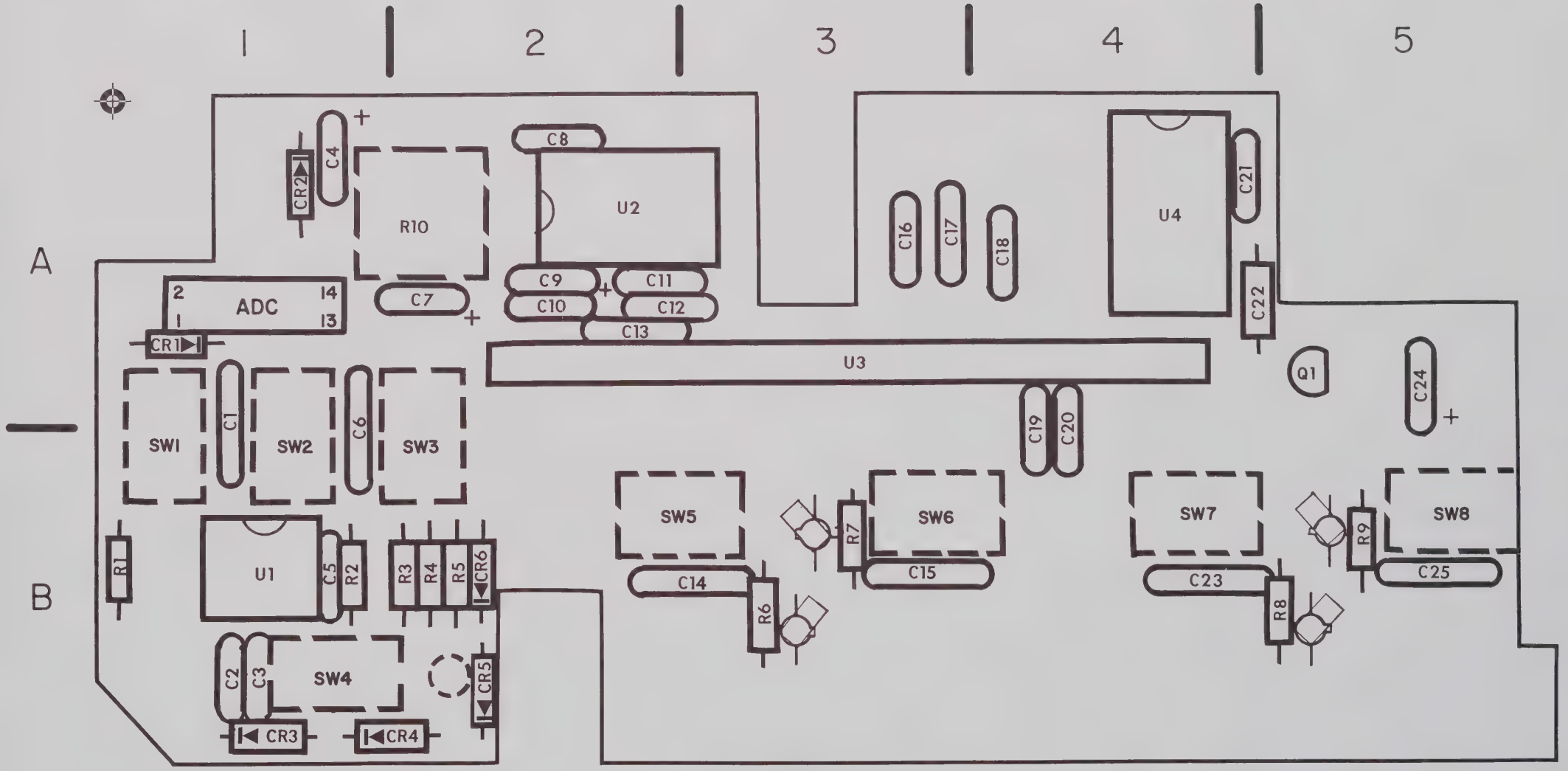
310 ADC Board
166-935501


1 1 2 1 3 1 4
A B C D
RS232
8 POS. DIP
STOP 8
PARITY 7
E/O 6
CR/LF 5
CV/CS 1
BR2 2
BR1 3
BR0 4
NOTE: ALL DIODES ARE IN4152
HORIZONTAL EXPANSION
S1
VERTICAL EXPANSION
S2
LIVE SW
STORE SW
LIVE
STORE
1,6
TIME
TIME PER POINT
S7
BSR
B OFF
CHAN B VOLTAGE SELECT
S5
ASR
A OFF
CHAN A VOLTAGE SELECT
S3
LS 125
64
CR4 CR2 CR5 CR28 CR6
CR11 CR62 CR29 CR30 CR64 CR63
CR13 CR12 CR10 CR9 CR1 CR3 CR7 CR8
CR53 CR54 CR57 CR58 CR59 CR55 CR56
CR61 CR35 CR60 CR36
CR31 CR32 CR33 CR34
16 HEX EN
23 RET 7
15 VEX EN
17 RET 6
19 RET 5
26 RET 4
20 RET 3
24 RET 2
21 RET 1
25 RET 0
13 RS232 EN
14 TIME
18 CH B
22 CH A
8 PIN STORAGE CONTROL-ADC
26 PIN ADC-CURSOR-PROC
CONNECTOR KEY
3 OF 3
NICOLET INSTRUMENT CORP
310 ADC BD (FRONT PANEL CIRCUIT)
166-935501 LMB 8-31-87

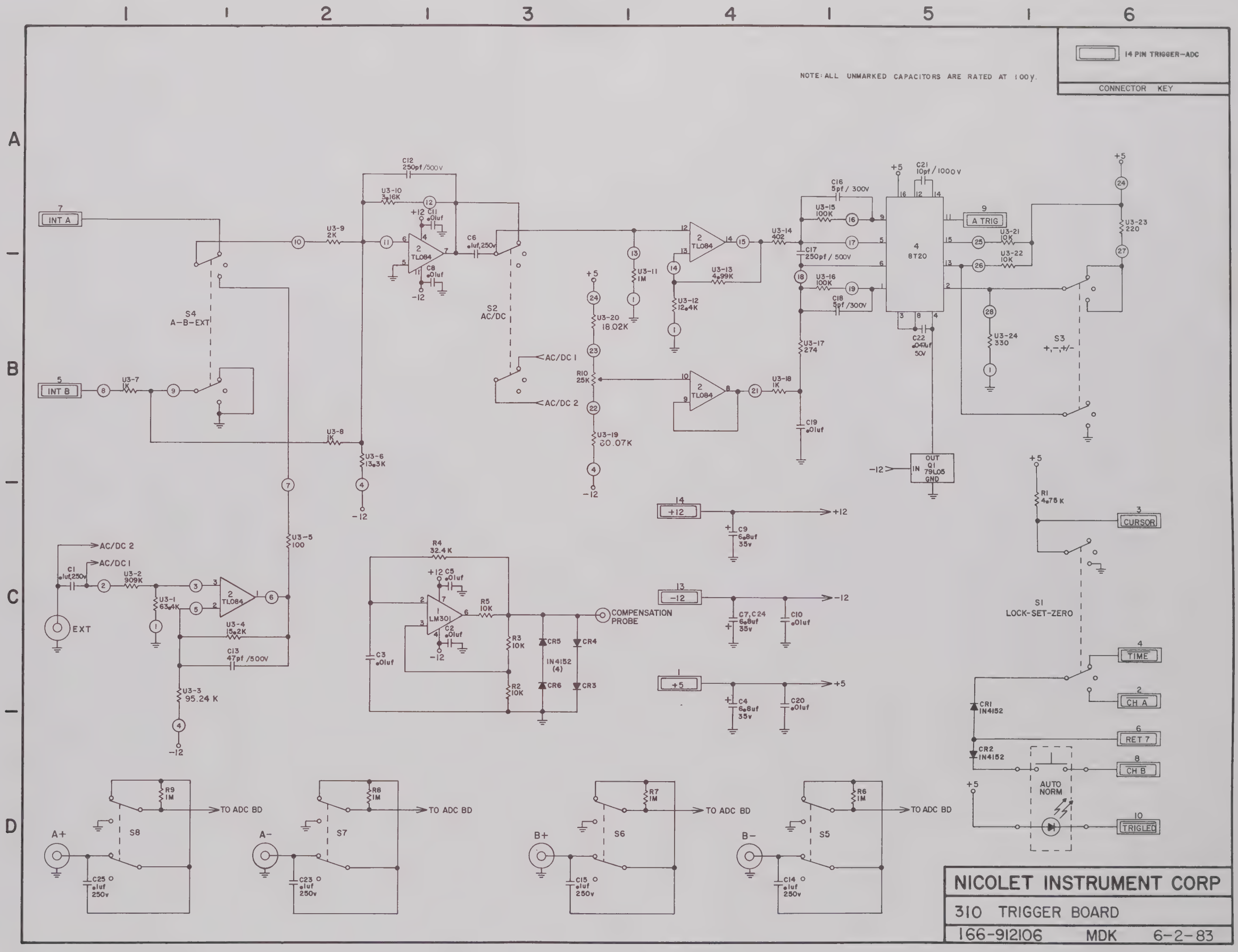


310 ADC Mod Board
166-933502


CHA INPUT
CH8 INPUT
U1
U9
AD9003 NOT IN LIBRARY
6 ANALOG IN
7 GAIN ADJ
8 GAIN/OFF ADJ
31 UNI OFF
32 UNI OFF
28 CORR BIT
27 CORR BIT
MSB
21 CONV STAT
20 ENCODE
LSB
DGND
AGND
DACAGND
+5
-15
J2
J3
+5A
+5B
+15V
-15V
8FESH
821KHZ
A/B-
U2
U3
U4
U5
U6
U7
U8
74ALS574
74ALS04
DATA0
DATA1
DATA2
DATA3
DATA4
DATA5
DATA6
DATA7
DATA8
DATA9
DATA10
DATA11
DATA BUS CONN.
P1
TESTPOINT
I/OENA-
WRPULSE
READ
RAS-
TEST CONN.
P2
U62 P9
U62 P14
L1
IND
360UH
L2
R1
10K
I/OEN
NICOLET INSTRUMENT CORP
Test Instrument Division
310 ADC
A/D, DIG MUX
SIZE
D
DRAWING NO. 166-933502
REV
02
ECN
7546
09:00:36
© 1987 Nicolet Instrument
03-31-88
A:3850MOD
SHEET 1 OF 1



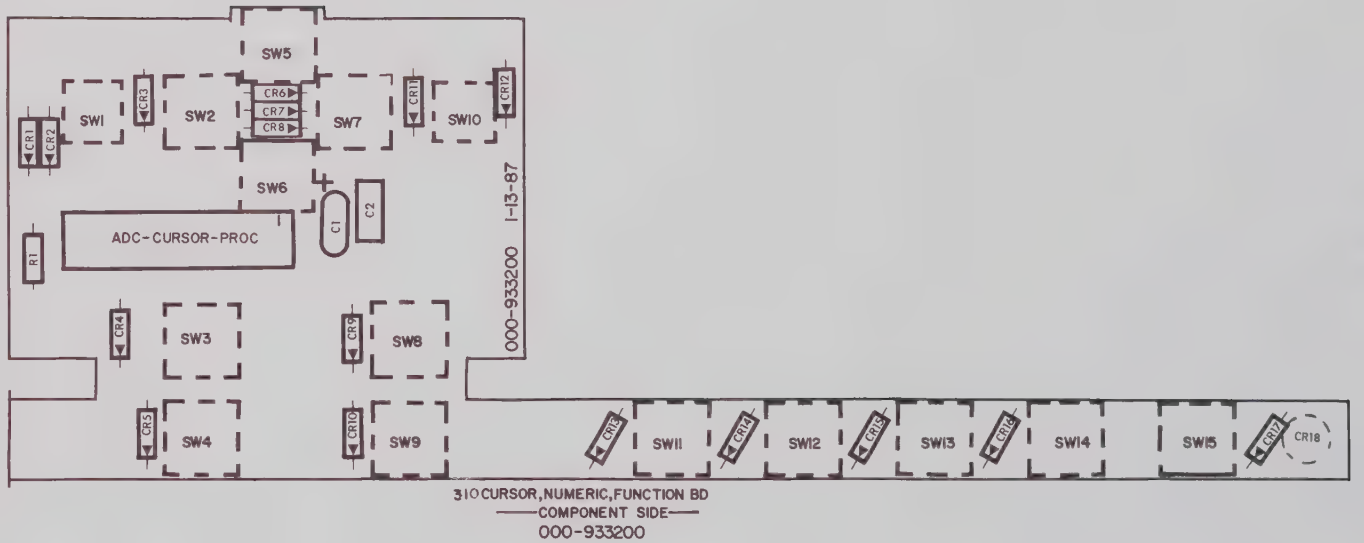
310 Trigger Board
166-912106



NICOLET INSTRUMENT CORP

310 TRIGGER BOARD

166-912106 MDK 6-2-83

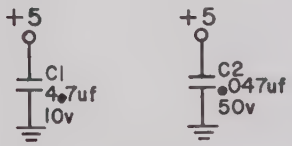


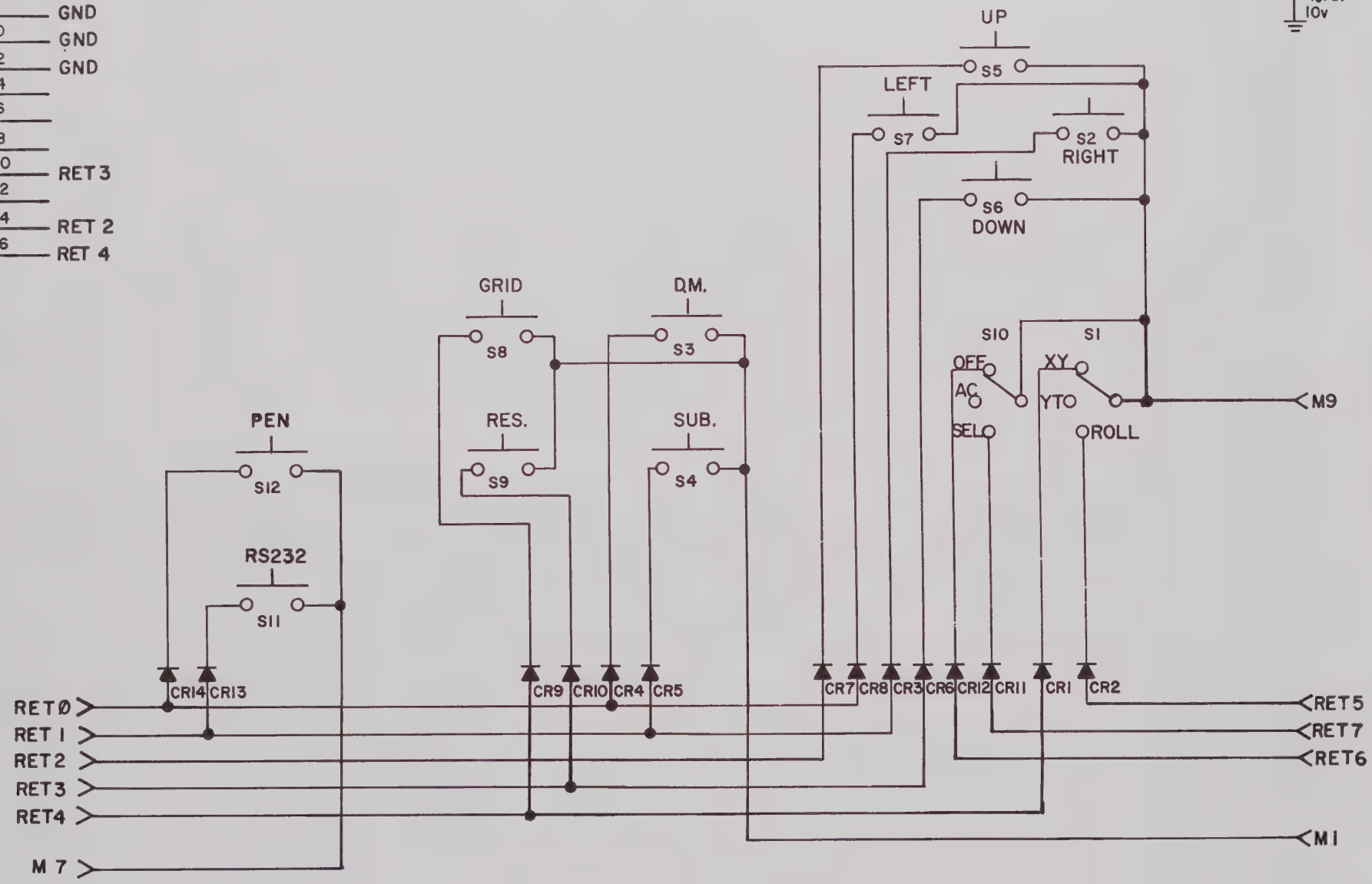
310 Cursor Board
166-932702

ADC-CURSOR-PROCESSOR

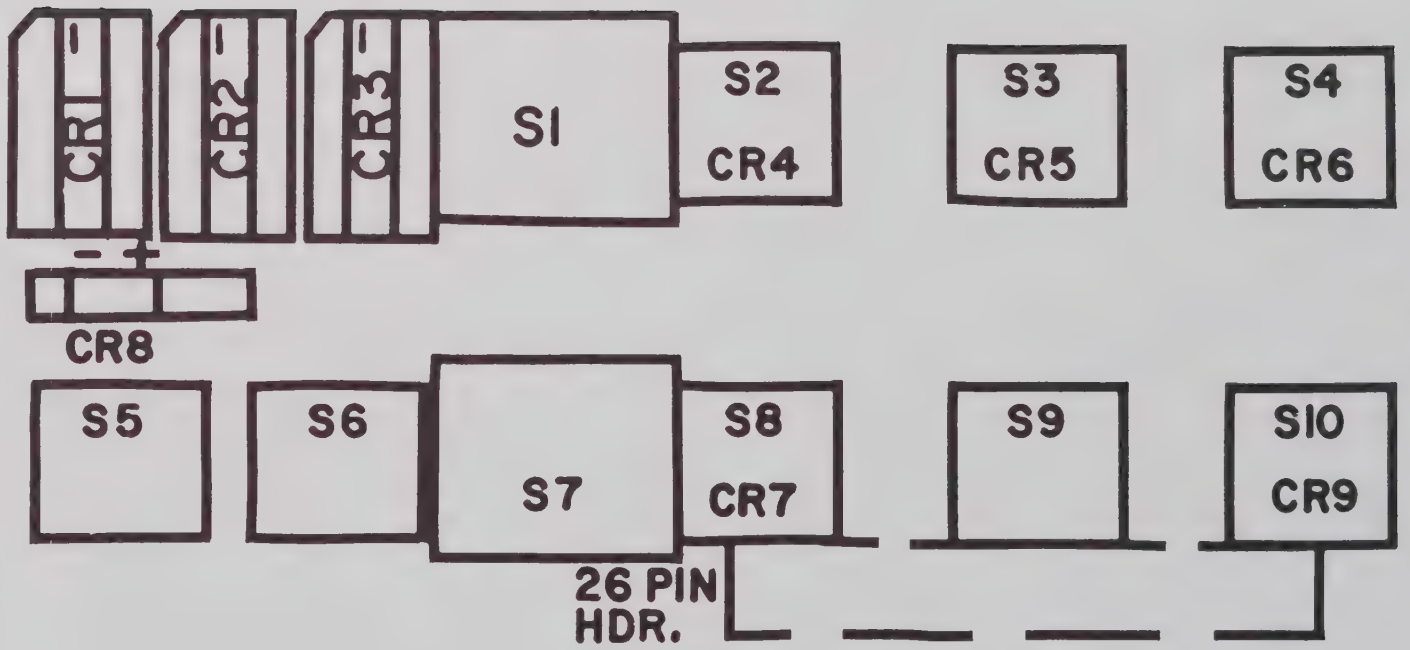
M9	1	2	GND
M7	3	4	GND
M1	5	6	GND
	7	8	GND
	9	10	GND
+5	11	12	GND
	13	14	
	15	16	
RET6	17	18	
RET5	19	20	RET3
RET1	21	22	
RET7	23	24	RET2
RET0	25	26	RET4

NOTE: ALL DIODES ARE IN4150

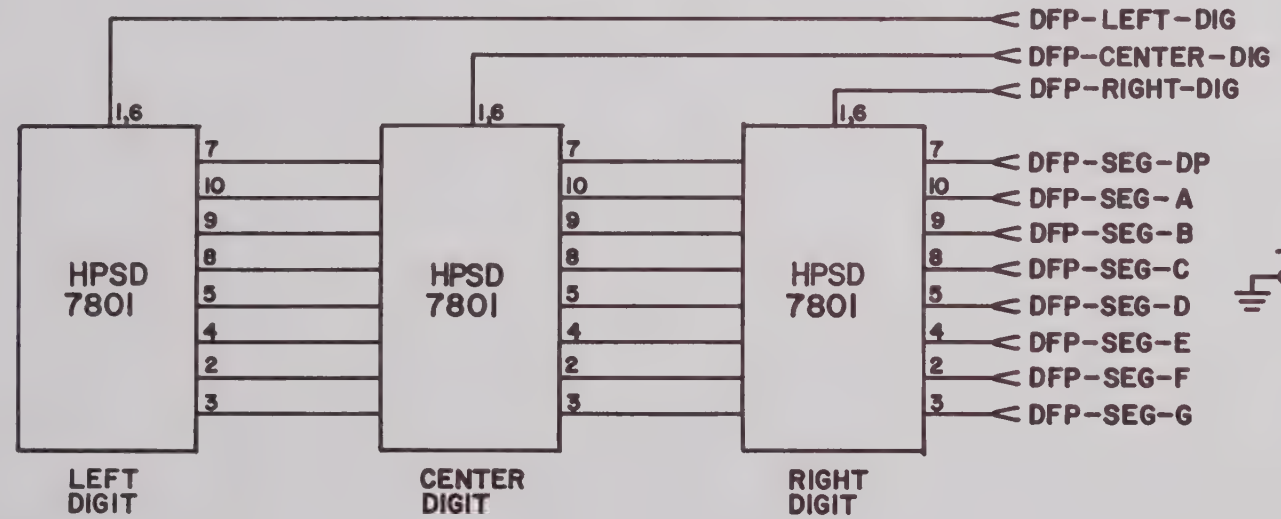


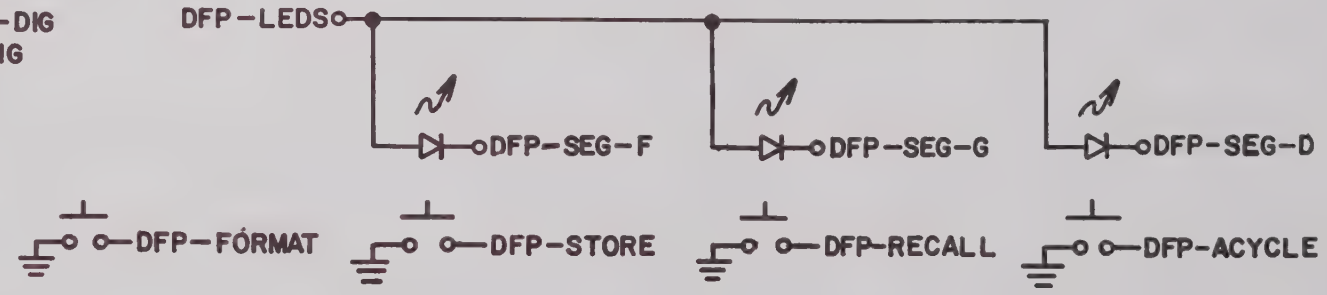


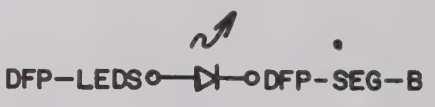
NICOLET INSTRUMENT CORP		
310 CURSOR,NUMERIC FUNCTION BD.		
166-939400	VLM	10-16-87

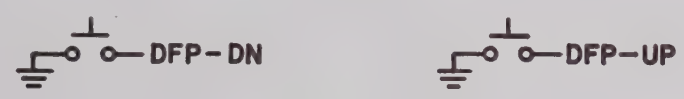


310 Front Panel Board
166-932702







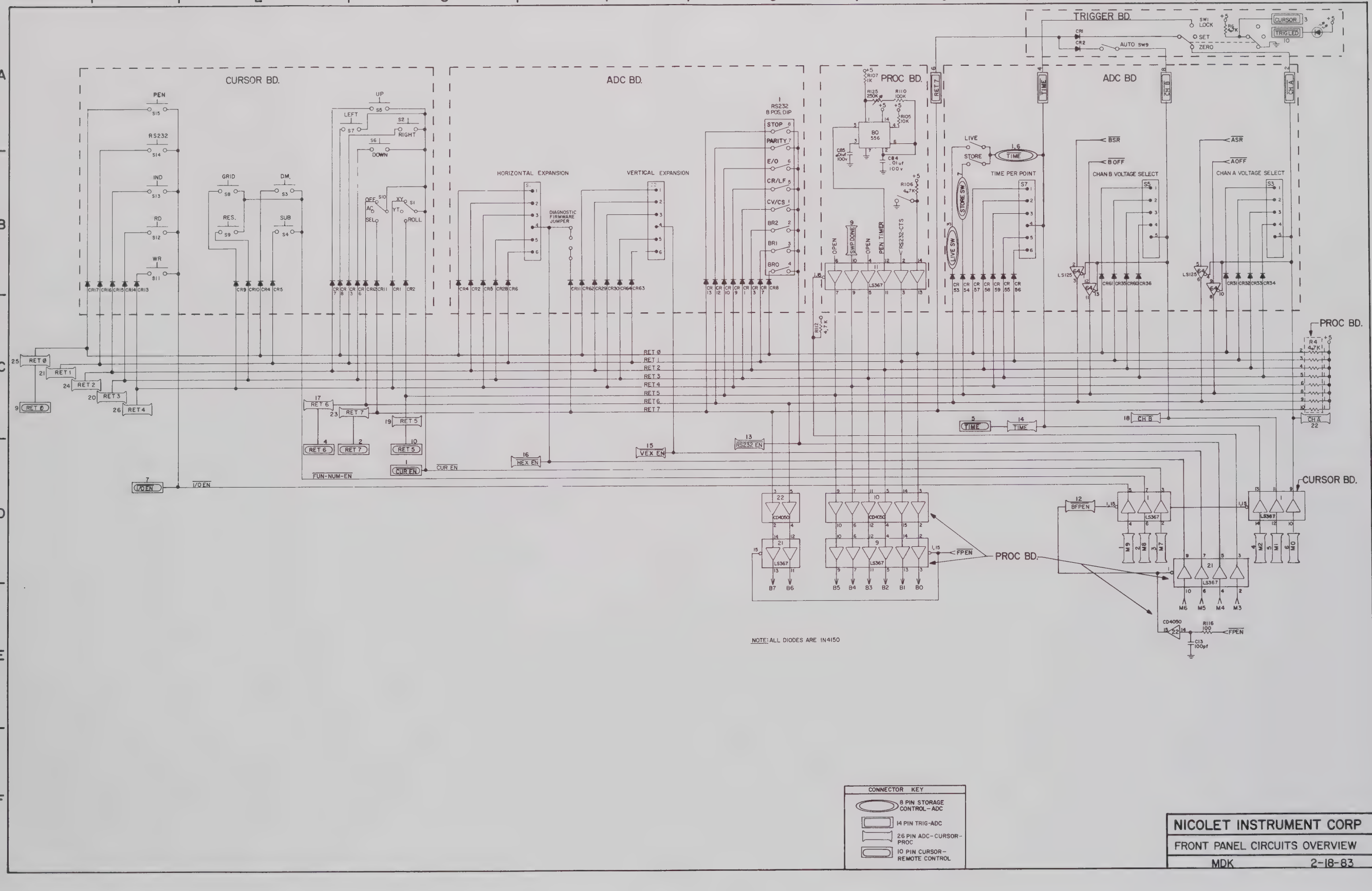


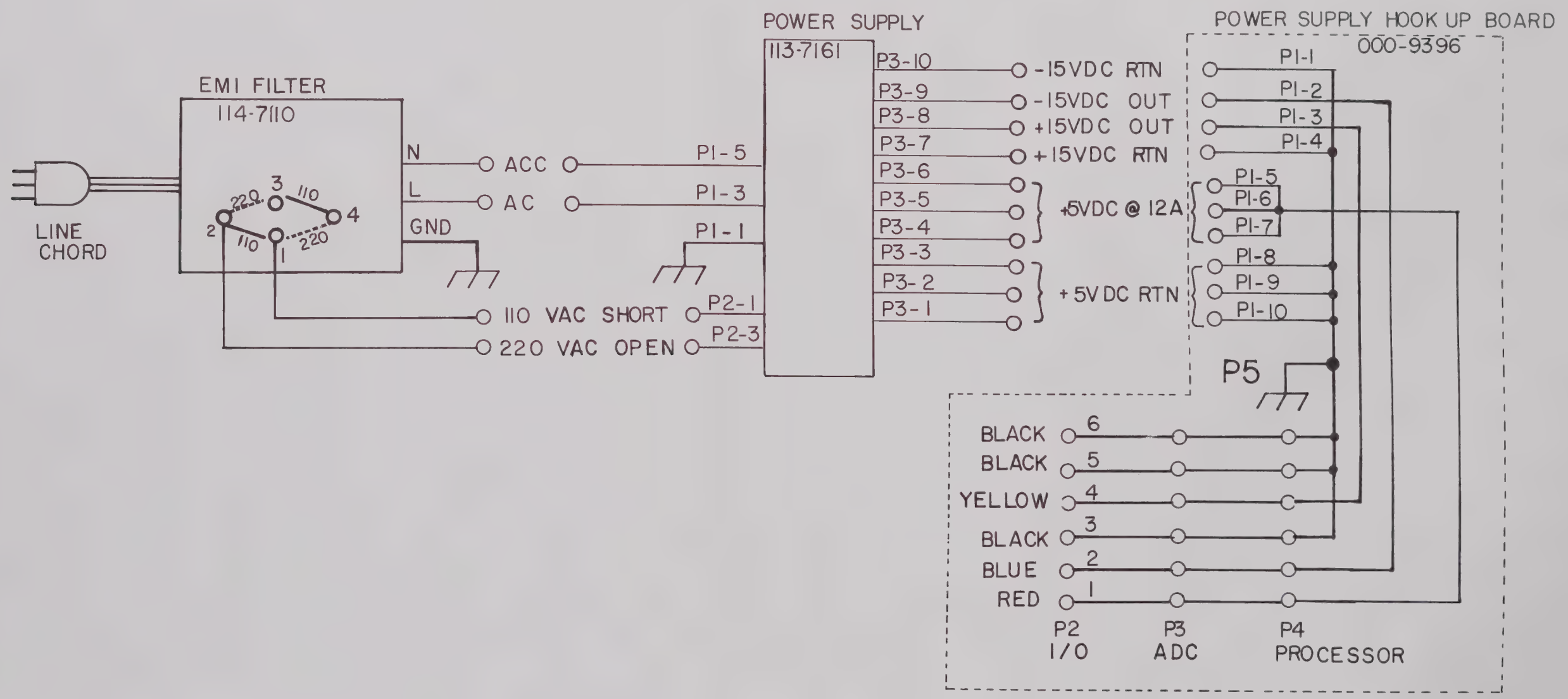
DFP-CENTER-DIG	1	2	DFP-LEDS
DFP-SEG-F	3	4	DFP-RIGHT-DIG
DFP-UP	5	6	DFP-LEFT-DIG
DFP-SEG-B	7	8	DFP-SEG-A
DFP-SEG-DP	9	10	DFP-SEG-C
DFP-ACYCLE	11	12	DFP-SEG-G
DFP-DN	13	14	DFP-SEG-E
DFP-RECALL	15	16	DFP-SEG-D
DFP-STORE	17	18	DFP-UNPROT
DFP-FORMAT	19	20	GND
FP-RESET	21	22	DFP-COPY
	23	24	

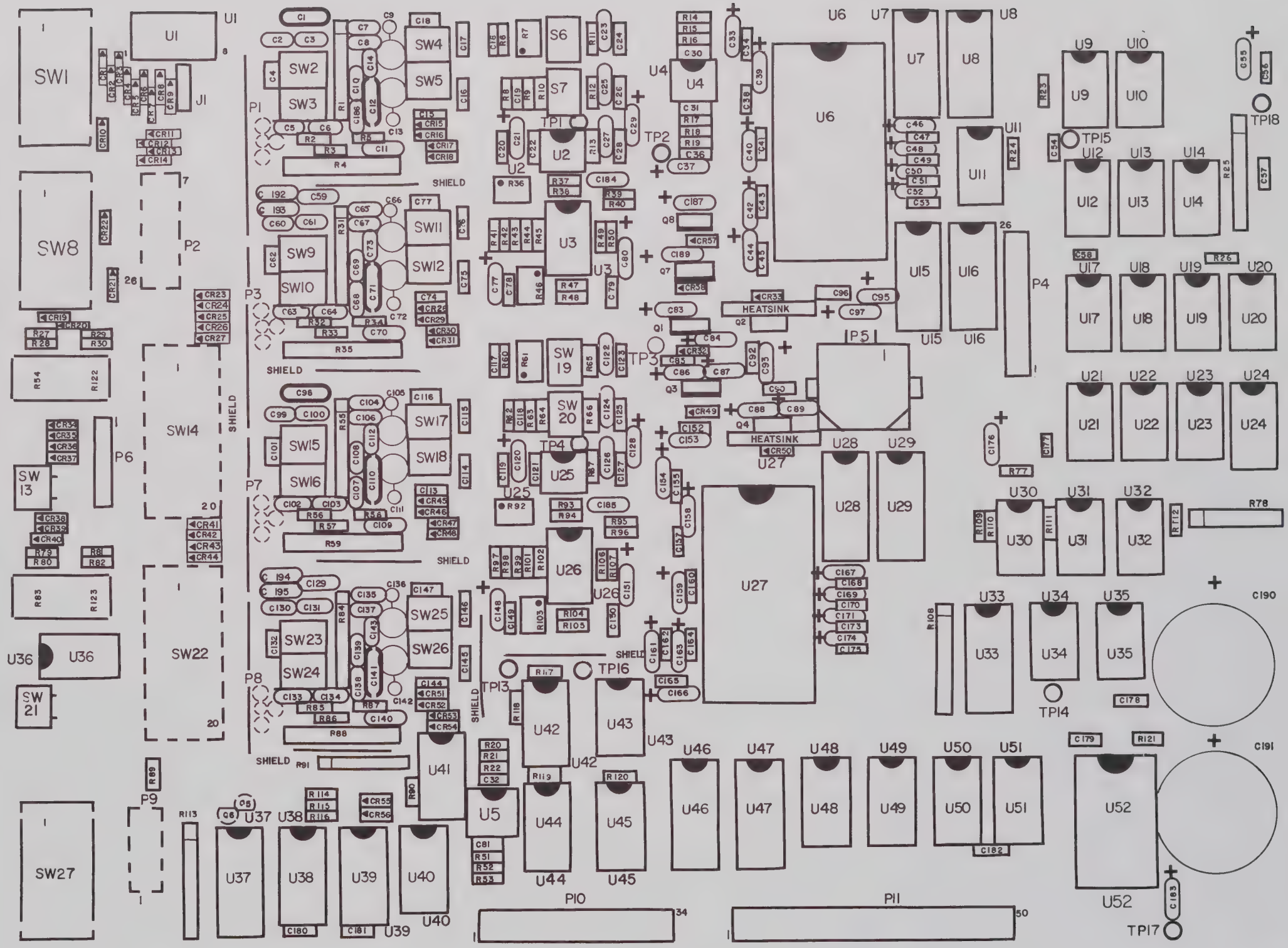
NICOLET INSTRUMENT CORP

310 FRONT PANEL BOARD

166-932702 MAR 12-31-87


TRIGGER BD.
CURSOR BD.
ADC BD.
PROC BD.
ADC BD
PROC BD.
CURSOR BD.
PEN
RS232
IND
RD
WR
GRID
DIM.
RES.
SUB.
UP
LEFT
RIGHT
DOWN
HORIZONTAL EXPANSION
VERTICAL EXPANSION
DIAGNOSTIC FIRMWARE JUMPER
RS232 8 POS. DIP
STOP
PARITY
E/O
CR/LF
CV/CS
BR2
BRI
BRO
LIVE
STORE
TIME
TIME PER POINT
STORE SW
LIVE SW
BSR
BOFF
CHAN B VOLTAGE SELECT
ASR
AOFF
CHAN A VOLTAGE SELECT
CURSOR
TRIG LED
SW1 LOCK
SET
ZERO
AUTO SW9
RET Ø
RET 1
RET 2
RET 3
RET 4
RET 5
RET 6
RET 7
I/O EN
CUR EN
HEX EN
VEX EN
RS232 EN
FUN-NUM-EN
FPEN
BFPEN
CH A
CH B
NOTE: ALL DIODES ARE IN4150
CONNECTOR KEY
8 PIN STORAGE CONTROL-ADC
14 PIN TRIG-ADC
26 PIN ADC-CURSOR-PROC
10 PIN CURSOR-REMOTE CONTROL
NICOLET INSTRUMENT CORP
FRONT PANEL CIRCUITS OVERVIEW
MDK 2-18-83


EMI FILTER
114-7110
LINE
CHORD
N
L
GND
ACC
AC
220
110
3
2
1
4
110 VAC SHORT
220 VAC OPEN
P1-5
P1-3
P1-1
P2-1
P2-3
POWER SUPPLY
113-7161
P3-10
P3-9
P3-8
P3-7
P3-6
P3-5
P3-4
P3-3
P3-2
P3-1
-15VDC RTN
-15VDC OUT
+15VDC OUT
+15VDC RTN
+5VDC @ 12A
+5VDC RTN
POWER SUPPLY HOOK UP BOARD
000-9396
P1-1
P1-2
P1-3
P1-4
P1-5
P1-6
P1-7
P1-8
P1-9
P1-10
P5
BLACK 6
BLACK 5
YELLOW 4
BLACK 3
BLUE 2
RED 1
P2
I/O
P3
ADC
P4
PROCESSOR



310 ADC Board
166-941301

NICOLET INSTRUMENT CORP
Test Instrument Division

310/3091 ADC BD
HIGH Z DECADE RANGES

SIZE D | DRAWING NO. 166-941301

REV ECN 01A 7987
05:15:87 © 1988 Nicolet Instrument 08-08-88
A:941308101 SHEET 1 OF 10

100-900100 CADDOCK NETWORK T1794-209

CHANNEL A

P1 -AINPUT

P2 -AINPUT

+15VA -15VA +5VA -5VA +12VRA

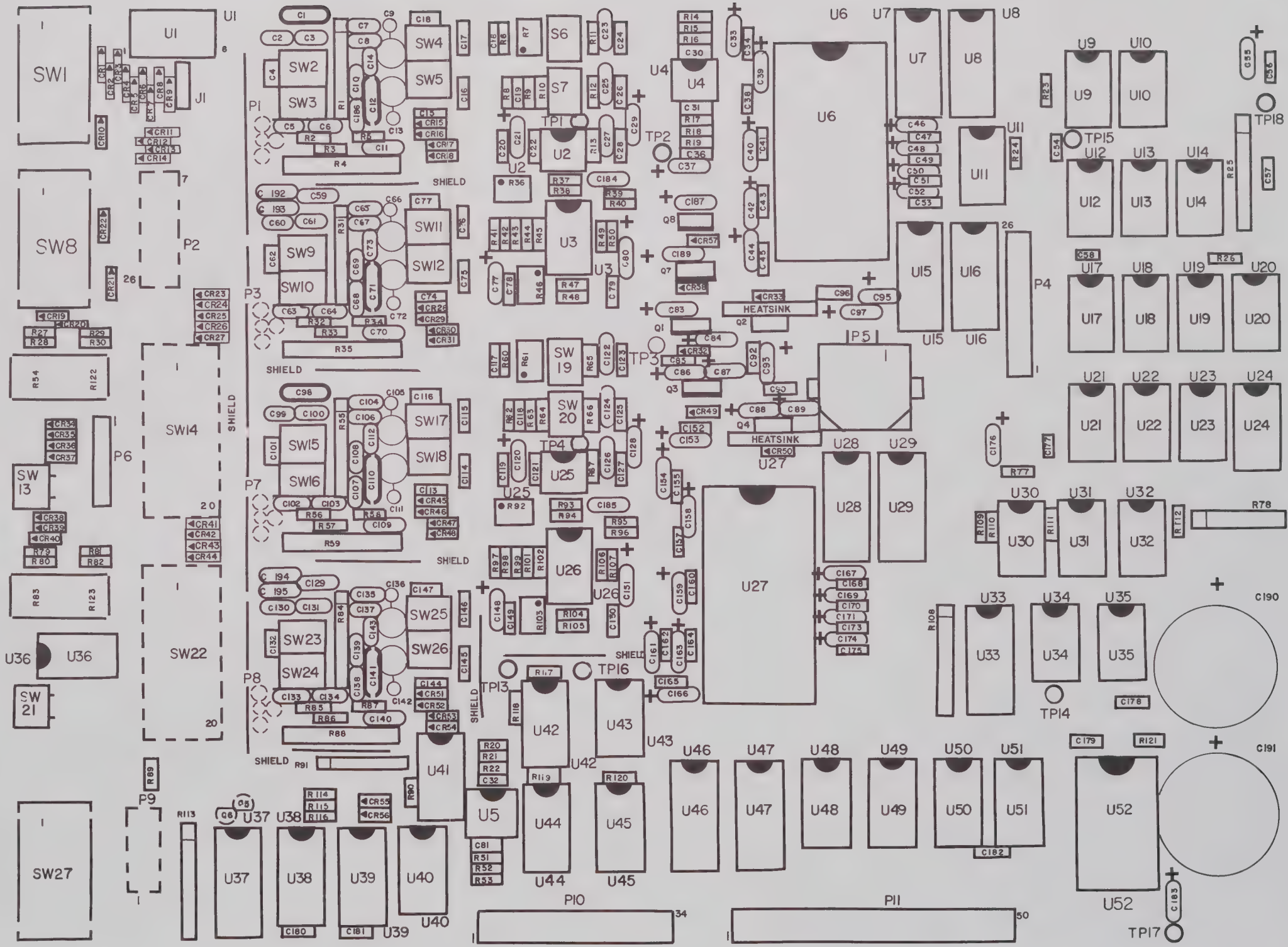
SW1 SW2 SW3 SW4 SW5 SW9 SW10 RELAY

R1 100K R2 1MEG R3 100 R4 27K 2W R5 27K 2W R31 100K R32 1MEG R33 100 R34 27K 2W

C1 1000pF 100V C2 C3 C4 C5 C6 27pF 300V C7 C8 12pF 300V C9 .25-1.5pF 250V C10 C11 .022 400V C12 .33pF 400V C13 C14 68pF 300V C15 C16 .047 50V C17 C18 C74 C75 C76 C77 .047 50V C59 C60 C61 C62 C63 C64 C65 C66 C67 C68 C71 C72 C73 C192 C193 8pF 300V C1112 C1186 15pF 300V R11 10K R12 99K R13 20M R14 20M R131 10K R132 99K

CR1 CR2 CR3 CR4 CR5 CR6 CR7 CR8 CR9 CR10 CR11 CR12 CR13 CR14 CR15 CR16 CR17 CR18 CR29 CR31 1N5248B 18V FDH300

-AIN +AIN



310 ADC Board
166-941301

NICOLET INSTRUMENT CORP
Test Instrument Division

310/3091 ADC BD
HIGH Z DECADE RANGES

SIZE D | DRAWING NO. 166-941301

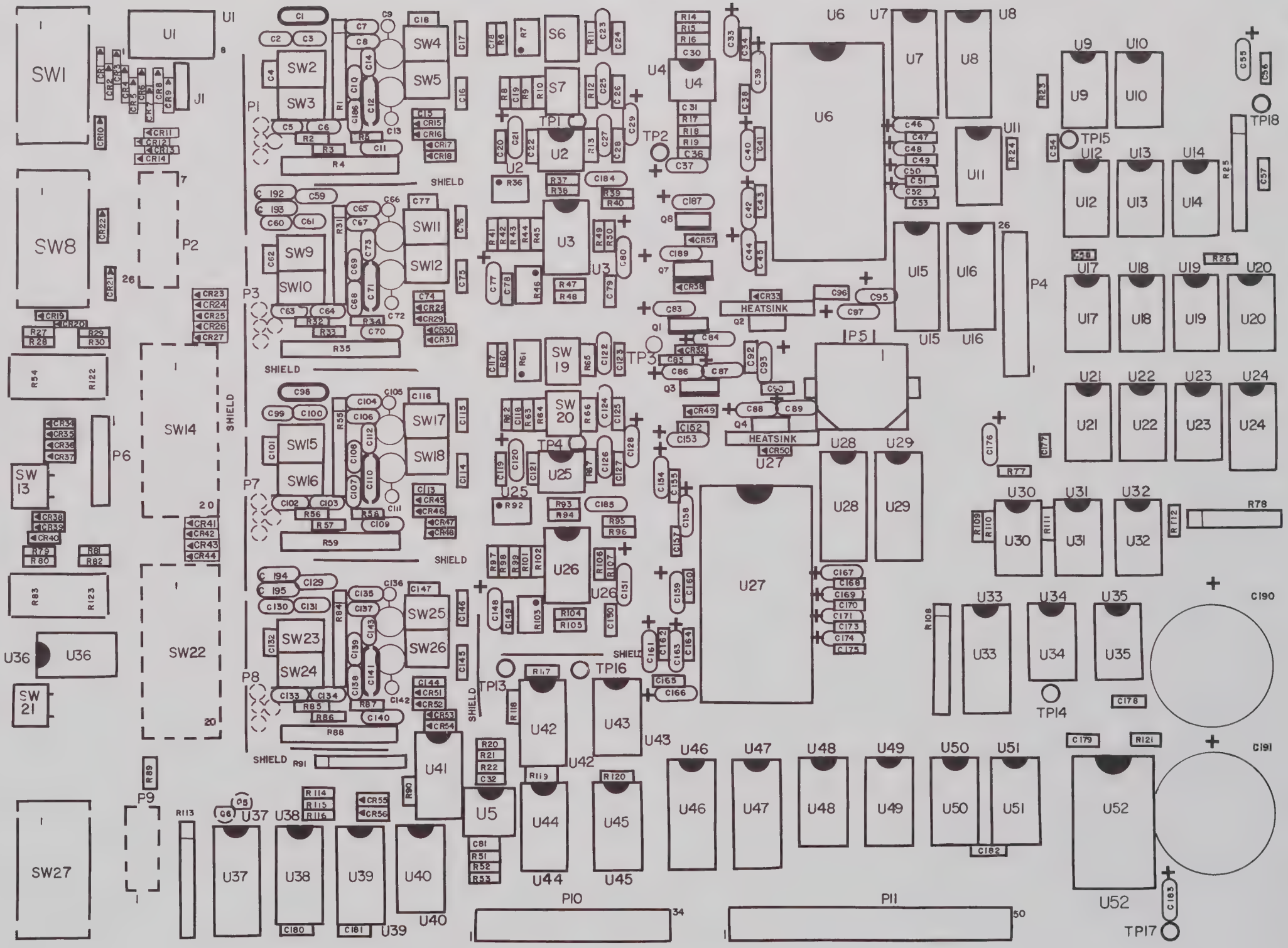
REV ECN 0IA 7987

05:17:33 © 1988 Nicolet Instrument 08-08-88

A:941308.DRF SHEET 2 OF 18

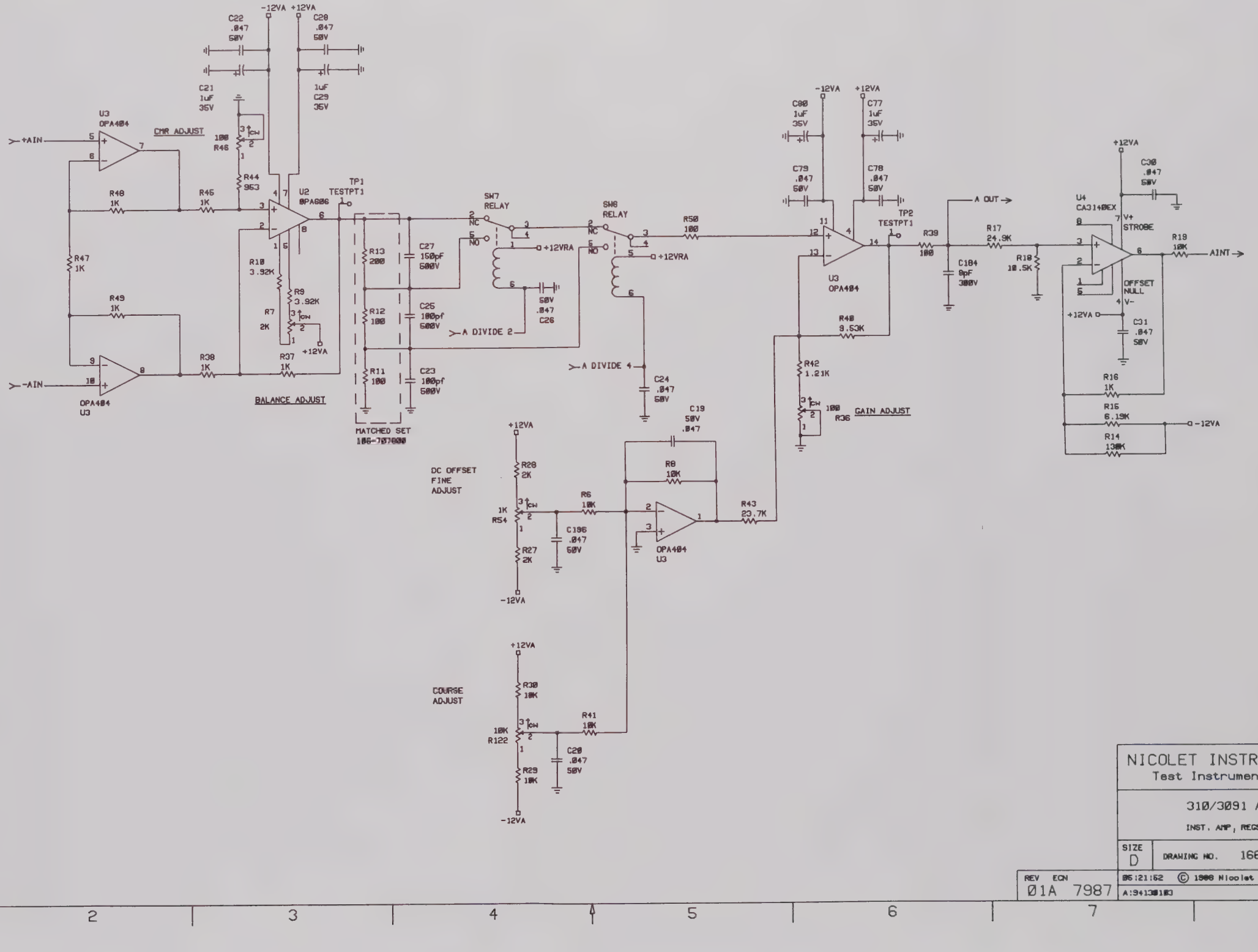
100-900100 CADDOCK NETWORK T1794-289

CHANNEL B

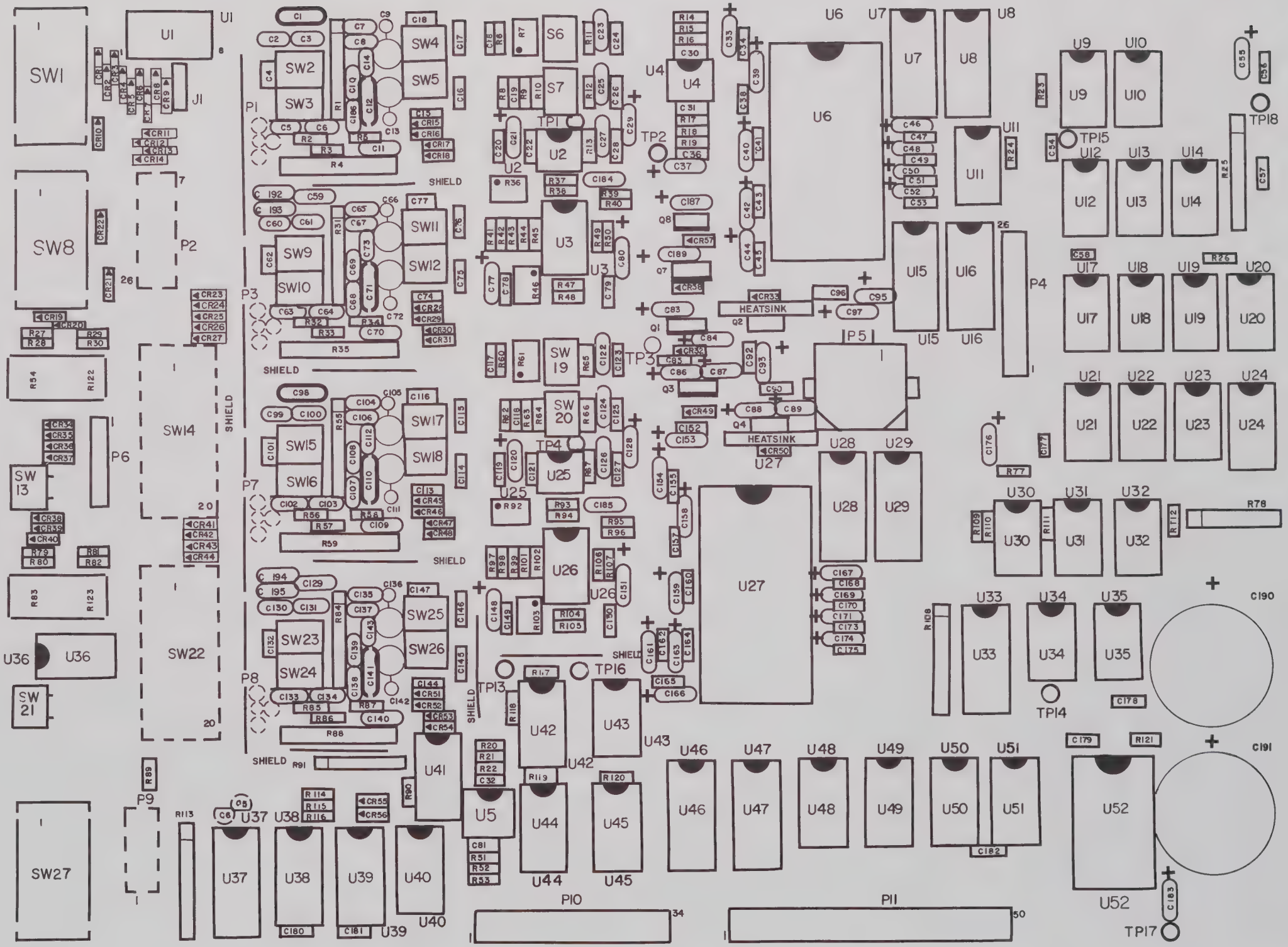


310 ADC Board
166-941301

CHANNEL A



NICOLET INSTRUMENT CORP Test Instrument Division	
310/3091 ADC BD INST. AMP, REGS, OFFSET	
SIZE D	DRAWING NO. 166-941301
REV ECN 01A 7987	06:21:52 © 1988 Nicolet Instrument 06-08-88
A:941301B3	SHEET 3 OF 18



310 ADC Board
166-941301

NICOLET INSTRUMENT CORP
Test Instrument Division

310/3091 ADC BD
INST. AMP, REGS, OFFSET

SIZE D | DRAWING NO. 166-941301

REV ECN 01A 7987

97/03/50 © 1986 Nicolet Instrument 86-86-86

A:941301B4 SHEET 4 OF 18

CHANNEL B

+12VB -12VB +12VRB +8IN -8IN BINT BOUT

U26 OPA404 U25 OPA606 U5 CA3140EX

R1 100K R2 6.19K R21 1K R22 1K R28 100K R31 10K R32 10K R33 10K R34 10K R36 9.53K R37 3.32K R38 3.32K R39 3.32K R40 10K R41 10K R42 10K R43 10K R44 10K R45 10K R46 10K R47 10K R48 2K R49 1K R50 2K R51 24.9K R52 10.5K R53 10K R54 10K R55 100 R56 100 R57 200 R58 100 R59 23.7K R60 10K R61 10K R62 10K R63 953 R64 100 R65 100 R66 100 R67 100 R68 1K R69 1K R70 1K R71 1K R72 1K R73 1K R74 1K R75 1K R76 1K R77 1K R78 1K R79 2K R80 2K R81 2K R82 2K R83 1K R84 1K R85 1K R86 1K R87 1K R88 1K R89 1K R90 1K R91 1K R92 100 R93 1K R94 1K R95 1K R96 100 R97 10K R98 1.21K R99 9.53K R100 100 R101 953 R102 1K R103 100 R104 1K R105 1K R106 1K

C1 .047 50V C2 .047 50V C3 .047 50V C4 .047 50V C5 .047 50V C6 .047 50V C7 .047 50V C8 .047 50V C9 .047 50V C10 .047 50V C11 .047 50V C12 .047 50V C13 .047 50V C14 .047 50V C15 .047 50V C16 .047 50V C17 .047 50V C18 .047 50V C19 .047 50V C20 1uF 35V C21 1uF 35V C22 100pF 500V C23 100pF 500V C24 100pF 500V C25 150pF 500V C26 .047 50V C27 .047 50V C28 1uF 35V C29 .047 50V C30 .047 50V C31 .047 50V C32 .047 50V C33 .047 50V C34 .047 50V C35 .047 50V C36 .047 50V C37 .047 50V C38 .047 50V C39 .047 50V C40 .047 50V C41 .047 50V C42 .047 50V C43 .047 50V C44 .047 50V C45 .047 50V C46 .047 50V C47 .047 50V C48 .047 50V C49 .047 50V C50 .047 50V C51 .047 50V C52 .047 50V C53 .047 50V C54 .047 50V C55 .047 50V C56 .047 50V C57 .047 50V C58 .047 50V C59 .047 50V C60 .047 50V C61 .047 50V C62 .047 50V C63 .047 50V C64 .047 50V C65 .047 50V C66 .047 50V C67 .047 50V C68 .047 50V C69 .047 50V C70 .047 50V C71 .047 50V C72 .047 50V C73 .047 50V C74 .047 50V C75 .047 50V C76 .047 50V C77 .047 50V C78 .047 50V C79 .047 50V C80 .047 50V C81 .047 50V C82 .047 50V C83 .047 50V C84 .047 50V C85 .047 50V C86 .047 50V C87 .047 50V C88 .047 50V C89 .047 50V C90 .047 50V C91 .047 50V C92 .047 50V C93 .047 50V C94 .047 50V C95 .047 50V C96 .047 50V C97 .047 50V C98 .047 50V C99 .047 50V C100 .047 50V C101 .047 50V C102 .047 50V C103 .047 50V C104 .047 50V C105 .047 50V C106 .047 50V C107 .047 50V C108 .047 50V C109 .047 50V C110 .047 50V C111 .047 50V C112 .047 50V C113 .047 50V C114 .047 50V C115 .047 50V C116 .047 50V C117 .047 50V C118 .047 50V C119 .047 50V C120 1uF 35V C121 .047 50V C122 100pF 500V C123 .047 50V C124 .047 50V C125 .047 50V C126 150pF 500V C127 .047 50V C128 1uF 35V C129 .047 50V C130 .047 50V C131 .047 50V C132 .047 50V C133 .047 50V C134 .047 50V C135 .047 50V C136 .047 50V C137 .047 50V C138 .047 50V C139 .047 50V C140 .047 50V C141 .047 50V C142 .047 50V C143 .047 50V C144 .047 50V C145 .047 50V C146 .047 50V C147 .047 50V C148 1uF 35V C149 .047 50V C150 .047 50V C151 1uF 35V C152 .047 50V C153 .047 50V C154 .047 50V C155 .047 50V C156 .047 50V C157 .047 50V C158 .047 50V C159 .047 50V C160 .047 50V C161 .047 50V C162 .047 50V C163 .047 50V C164 .047 50V C165 .047 50V C166 .047 50V C167 .047 50V C168 .047 50V C169 .047 50V C170 .047 50V C171 .047 50V C172 .047 50V C173 .047 50V C174 .047 50V C175 .047 50V C176 .047 50V C177 .047 50V C178 .047 50V C179 .047 50V C180 .047 50V C181 .047 50V C182 .047 50V C183 .047 50V C184 .047 50V C185 8pF 300V C186 .047 50V C187 .047 50V C188 .047 50V C189 .047 50V C190 .047 50V C191 .047 50V C192 .047 50V C193 .047 50V C194 .047 50V C195 .047 50V C196 .047 50V C197 .047 50V C198 .047 50V C199 .047 50V C200 .047 50V C201 .047 50V C202 .047 50V C203 .047 50V C204 .047 50V C205 .047 50V C206 .047 50V C207 .047 50V C208 .047 50V C209 .047 50V C210 .047 50V C211 .047 50V C212 .047 50V C213 .047 50V C214 .047 50V C215 .047 50V C216 .047 50V C217 .047 50V C218 .047 50V C219 .047 50V C220 .047 50V C221 .047 50V C222 .047 50V C223 .047 50V C224 .047 50V C225 .047 50V C226 .047 50V C227 .047 50V C228 .047 50V C229 .047 50V C230 .047 50V C231 .047 50V C232 .047 50V C233 .047 50V C234 .047 50V C235 .047 50V C236 .047 50V C237 .047 50V C238 .047 50V C239 .047 50V C240 .047 50V C241 .047 50V C242 .047 50V C243 .047 50V C244 .047 50V C245 .047 50V C246 .047 50V C247 .047 50V C248 .047 50V C249 .047 50V C250 .047 50V C251 .047 50V C252 .047 50V C253 .047 50V C254 .047 50V C255 .047 50V C256 .047 50V C257 .047 50V C258 .047 50V C259 .047 50V C260 .047 50V C261 .047 50V C262 .047 50V C263 .047 50V C264 .047 50V C265 .047 50V C266 .047 50V C267 .047 50V C268 .047 50V C269 .047 50V C270 .047 50V C271 .047 50V C272 .047 50V C273 .047 50V C274 .047 50V C275 .047 50V C276 .047 50V C277 .047 50V C278 .047 50V C279 .047 50V C280 .047 50V C281 .047 50V C282 .047 50V C283 .047 50V C284 .047 50V C285 .047 50V C286 .047 50V C287 .047 50V C288 .047 50V C289 .047 50V C290 .047 50V C291 .047 50V C292 .047 50V C293 .047 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C365 .047 50V C366 .047 50V C367 .047 50V C368 .047 50V C369 .047 50V C370 .047 50V C371 .047 50V C372 .047 50V C373 .047 50V C374 .047 50V C375 .047 50V C376 .047 50V C377 .047 50V C378 .047 50V C379 .047 50V C380 .047 50V C381 .047 50V C382 .047 50V C383 .047 50V C384 .047 50V C385 .047 50V C386 .047 50V C387 .047 50V C388 .047 50V C389 .047 50V C390 .047 50V C391 .047 50V C392 .047 50V C393 .047 50V C394 .047 50V C395 .047 50V C396 .047 50V C397 .047 50V C398 .047 50V C399 .047 50V C400 .047 50V C401 .047 50V C402 .047 50V C403 .047 50V C404 .047 50V C405 .047 50V C406 .047 50V C407 .047 50V C408 .047 50V C409 .047 50V C410 .047 50V C411 .047 50V C412 .047 50V C413 .047 50V C414 .047 50V C415 .047 50V C416 .047 50V C417 .047 50V C418 .047 50V C419 .047 50V C420 .047 50V C421 .047 50V C422 .047 50V C423 .047 50V C424 .047 50V C425 .047 50V C426 .047 50V C427 .047 50V C428 .047 50V C429 .047 50V C430 .047 50V C431 .047 50V C432 .047 50V C433 .047 50V C434 .047 50V C435 .047 50V C436 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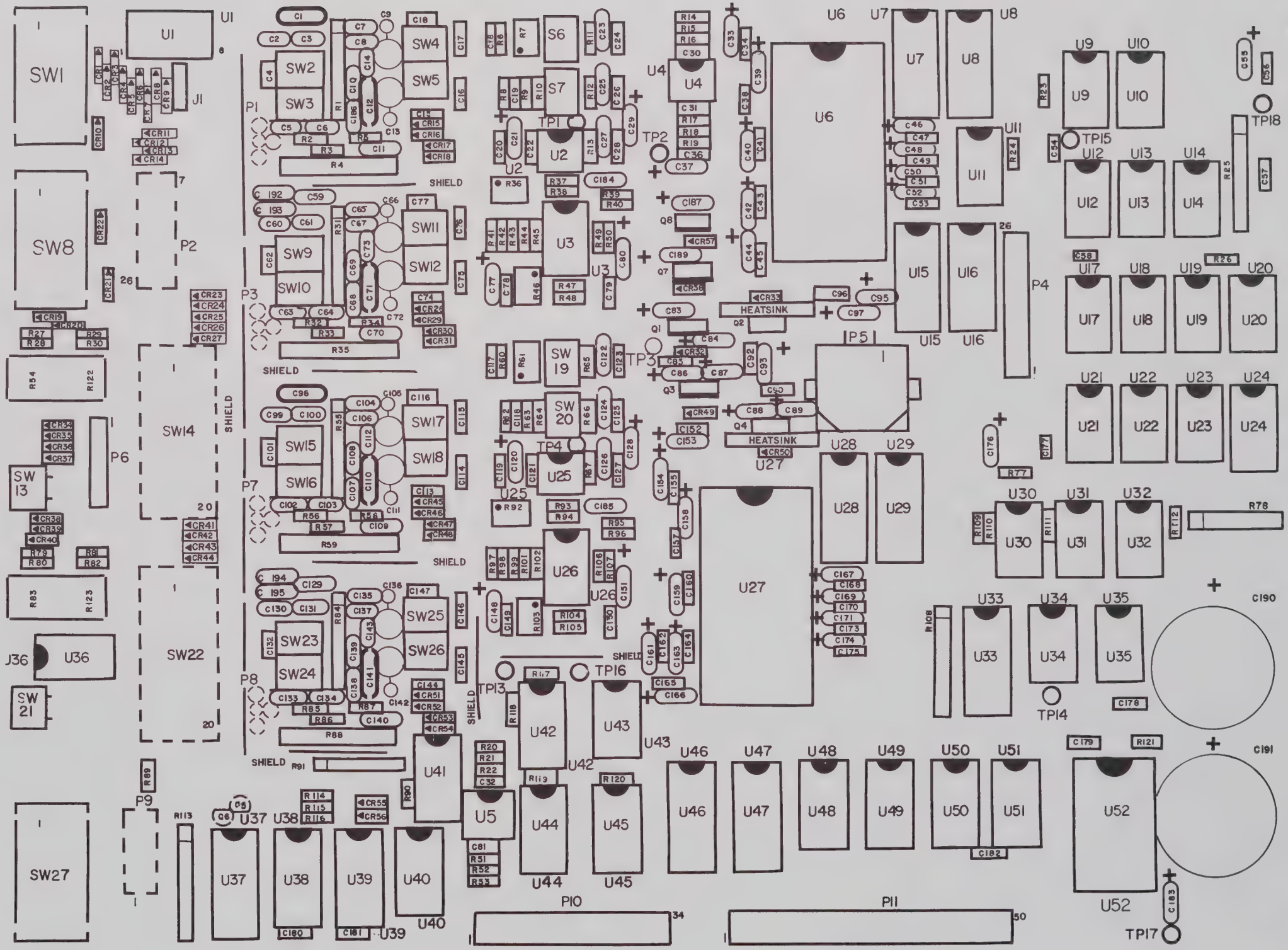
50V C722 .047 50V C723 .047 50V C724 .047 50V C725 .047 50V C726 .047 50V C727 .047 50V C728 .047 50V C729 .047 50V C730 .047 50V C731 .047 50V C732 .047 50V C733 .047 50V C734 .047 50V C735 .047 50V C736 .047 50V C737 .047 50V C738 .047 50V C739 .047 50V C740 .047 50V C741 .047 50V C742 .047 50V C743 .047 50V C744 .047 50V C745 .047 50V C746 .047 50V C747 .047 50V C748 .047 50V C749 .047 50V C750 .047 50V C751 .047 50V C752 .047 50V C753 .047 50V C754 .047 50V C755 .047 50V C756 .047 50V C757 .047 50V C758 .047 50V C759 .047 50V C760 .047 50V C761 .047 50V C762 .047 50V C763 .047 50V C764 .047 50V C765 .047 50V C766 .047 50V C767 .047 50V C768 .047 50V C769 .047 50V C770 .047 50V C771 .047 50V C772 .047 50V C773 .047 50V C774 .047 50V C775 .047 50V C776 .047 50V C777 .047 50V C778 .047 50V C779 .047 50V C780 .047 50V C781 .047 50V C782 .047 50V C783 .047 50V C784 .047 50V C785 .047 50V C786 .047 50V C787 .047 50V C788 .047 50V C789 .047 50V C790 .047 50V C791 .047 50V C792 .047 50V C793 .047 50V C794 .047 50V C795 .047 50V C796 .047 50V C797 .047 50V C798 .047 50V C799 .047 50V C800 .047 50V C801 .047 50V C802 .047 50V C803 .047 50V C804 .047 50V C805 .047 50V C806 .047 50V C807 .047 50V C808 .047 50V C809 .047 50V C810 .047 50V C811 .047 50V C812 .047 50V C813 .047 50V C814 .047 50V C815 .047 50V C816 .047 50V C817 .047 50V C818 .047 50V C819 .047 50V C820 .047 50V C821 .047 50V C822 .047 50V C823 .047 50V C824 .047 50V C825 .047 50V C826 .047 50V C827 .047 50V C828 .047 50V C829 .047 50V C830 .047 50V C831 .047 50V C832 .047 50V C833 .047 50V C834 .047 50V C835 .047 50V C836 .047 50V C837 .047 50V C838 .047 50V C839 .047 50V C840 .047 50V C841 .047 50V C842 .047 50V C843 .047 50V C844 .047 50V C845 .047 50V C846 .047 50V C847 .047 50V C848 .047 50V C849 .047 50V C850 .047 50V C851 .047 50V C852 .047 50V C853 .047 50V C854 .047 50V C855 .047 50V C856 .047 50V C857 .047 50V C858 .047 50V C859 .047 50V C860 .047 50V C861 .047 50V C862 .047 50V C863 .047 50V C864 .047 50V C865 .047 50V C866 .047 50V C867 .047 50V C868 .047 50V C869 .047 50V C870 .047 50V C871 .047 50V C872 .047 50V C873 .047 50V C874 .047 50V C875 .047 50V C876 .047 50V C877 .047 50V C878 .047 50V C879 .047 50V C880 .047 50V C881 .047 50V C882 .047 50V C883 .047 50V C884 .047 50V C885 .047 50V C886 .047 50V C887 .047 50V C888 .047 50V C889 .047 50V C890 .047 50V C891 .047 50V C892 .047 50V C893 .047 50V C894 .047 50V C895 .047 50V C896 .047 50V C897 .047 50V C898 .047 50V C899 .047 50V C900 .047 50V C901 .047 50V C902 .047 50V C903 .047 50V C904 .047 50V C905 .047 50V C906 .047 50V C907 .047 50V C908 .047 50V C909 .047 50V C910 .047 50V C911 .047 50V C912 .047 50V C913 .047 50V C914 .047 50V C915 .047 50V C916 .047 50V C917 .047 50V C918 .047 50V C919 .047 50V C920 .047 50V C921 .047 50V C922 .047 50V C923 .047 50V C924 .047 50V C925 .047 50V C926 .047 50V C927 .047 50V C928 .047 50V C929 .047 50V C930 .047 50V C931 .047 50V C932 .047 50V C933 .047 50V C934 .047 50V C935 .047 50V C936 .047 50V C937 .047 50V C938 .047 50V C939 .047 50V C940 .047 50V C941 .047 50V C942 .047 50V C943 .047 50V C944 .047 50V C945 .047 50V C946 .047 50V C947 .047 50V C948 .047 50V C949 .047 50V C950 .047 50V C951 .047 50V C952 .047 50V C953 .047 50V C954 .047 50V C955 .047 50V C956 .047 50V C957 .047 50V C958 .047 50V C959 .047 50V C960 .047 50V C961 .047 50V C962 .047 50V C963 .047 50V C964 .047 50V C965 .047 50V C966 .047 50V C967 .047 50V C968 .047 50V C969 .047 50V C970 .047 50V C971 .047 50V C972 .047 50V C973 .047 50V C974 .047 50V C975 .047 50V C976 .047 50V C977 .047 50V C978 .047 50V C979 .047 50V C980 .047 50V C981 .047 50V C982 .047 50V C983 .047 50V C984 .047 50V C985 .047 50V C986 .047 50V C987 .047 50V C988 .047 50V C989 .047 50V C990 .047 50V C991 .047 50V C992 .047 50V C993 .047 50V C994 .047 50V C995 .047 50V C996 .047 50V C997 .047 50V C998 .047 50V C999 .047 50V C1000 .047 50V

SW19 RELAY SW20 RELAY

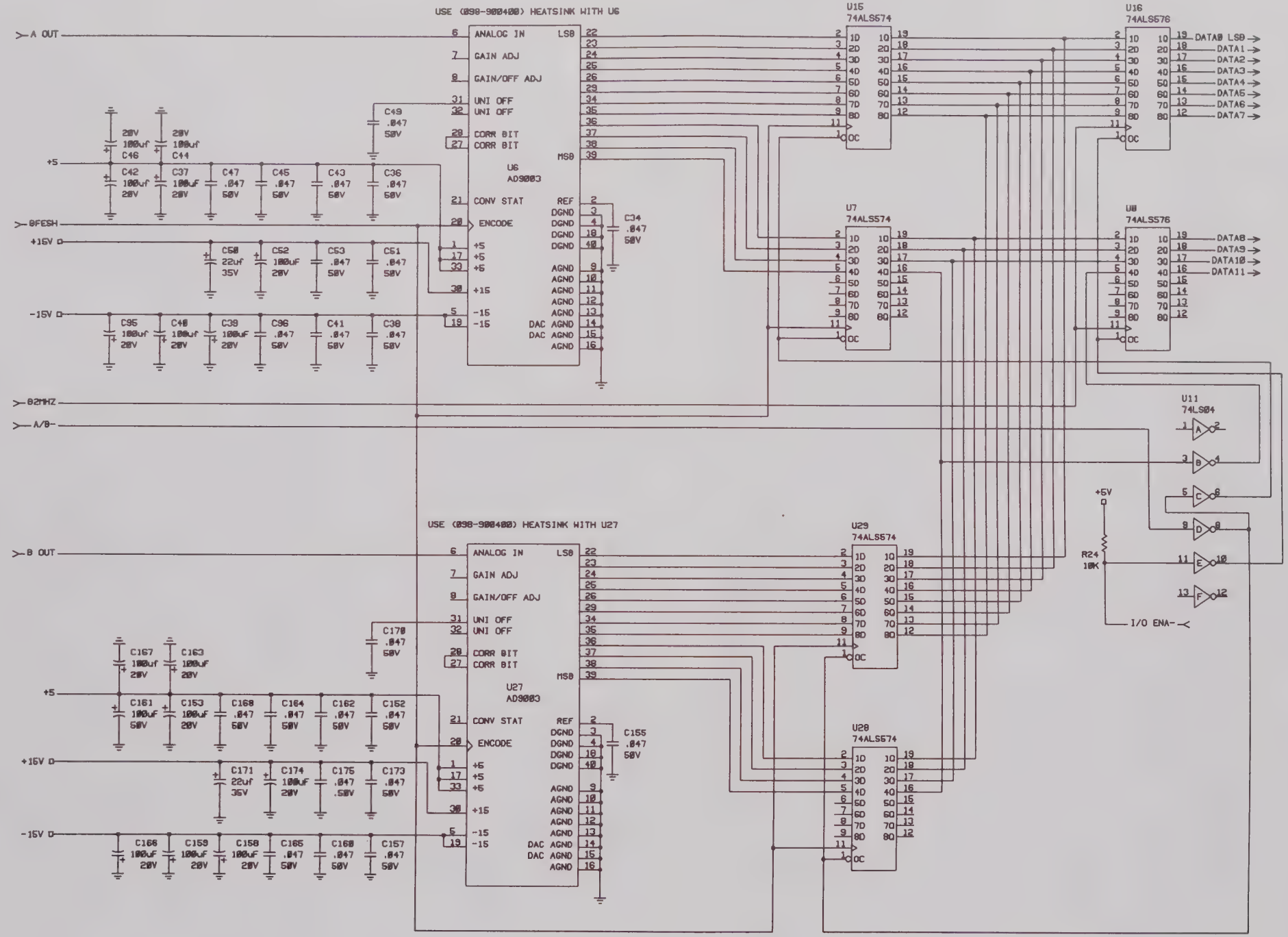
TP1 TESTPT1 TP2 TESTPT1 TP3 TESTPT1 TP4 TESTPT1

B DIVIDE 4 B DIVIDE 2

COURSE ADJUST DC OFFSET FINE ADJUST MATCHED SET 186-707800 BALANCE ADJUST GAIN ADJUST CMR ADJUST OFFSET NULL STROBE



310 ADC Board
166-941301



NICOLET INSTRUMENT CORP
Test Instrument Division

310/3091 ADC BD

A/D, DIG MUX

SIZE	DRAWING NO.	REV	ECN
D	166-941301	Ø1A	7987

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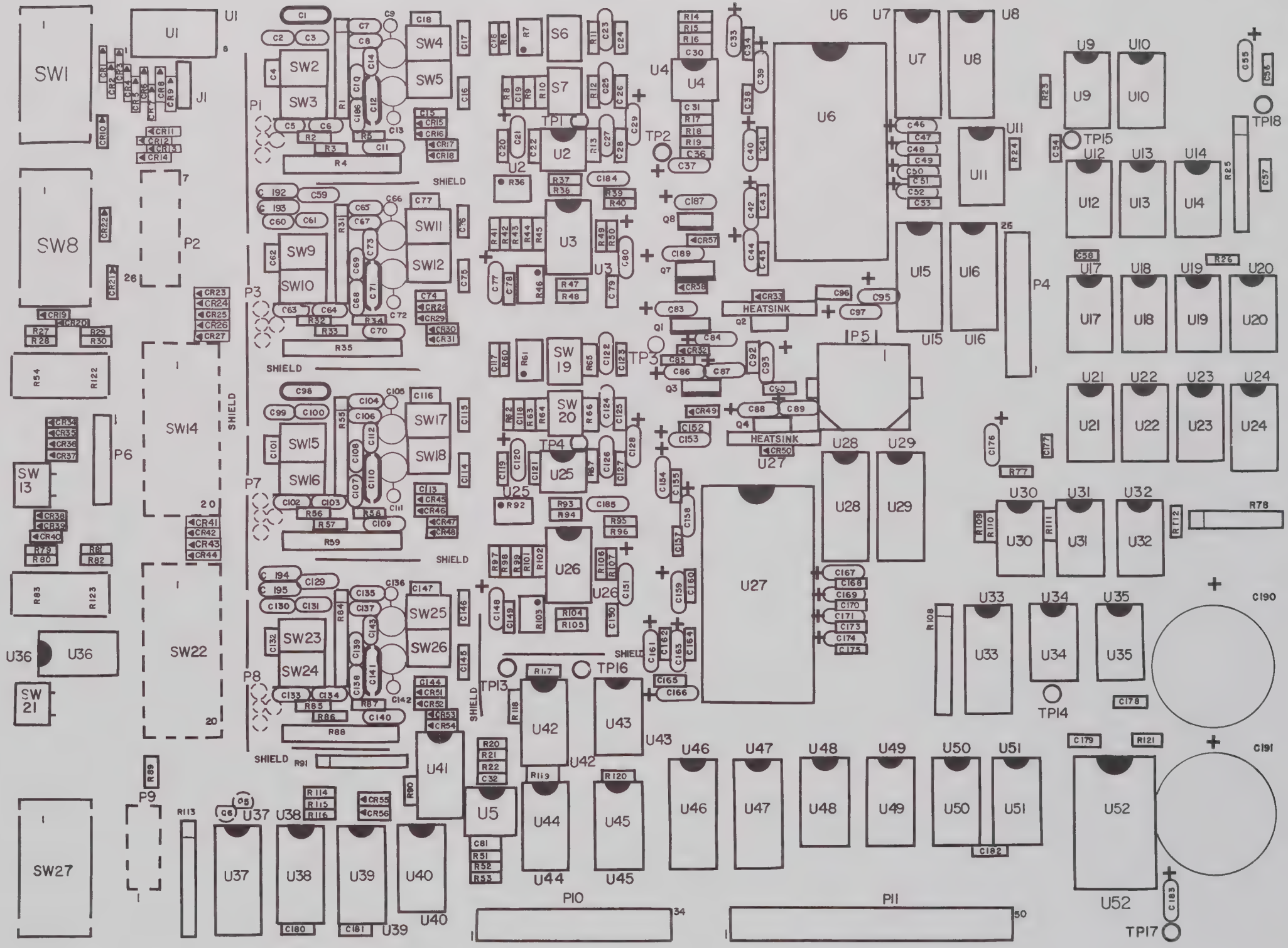
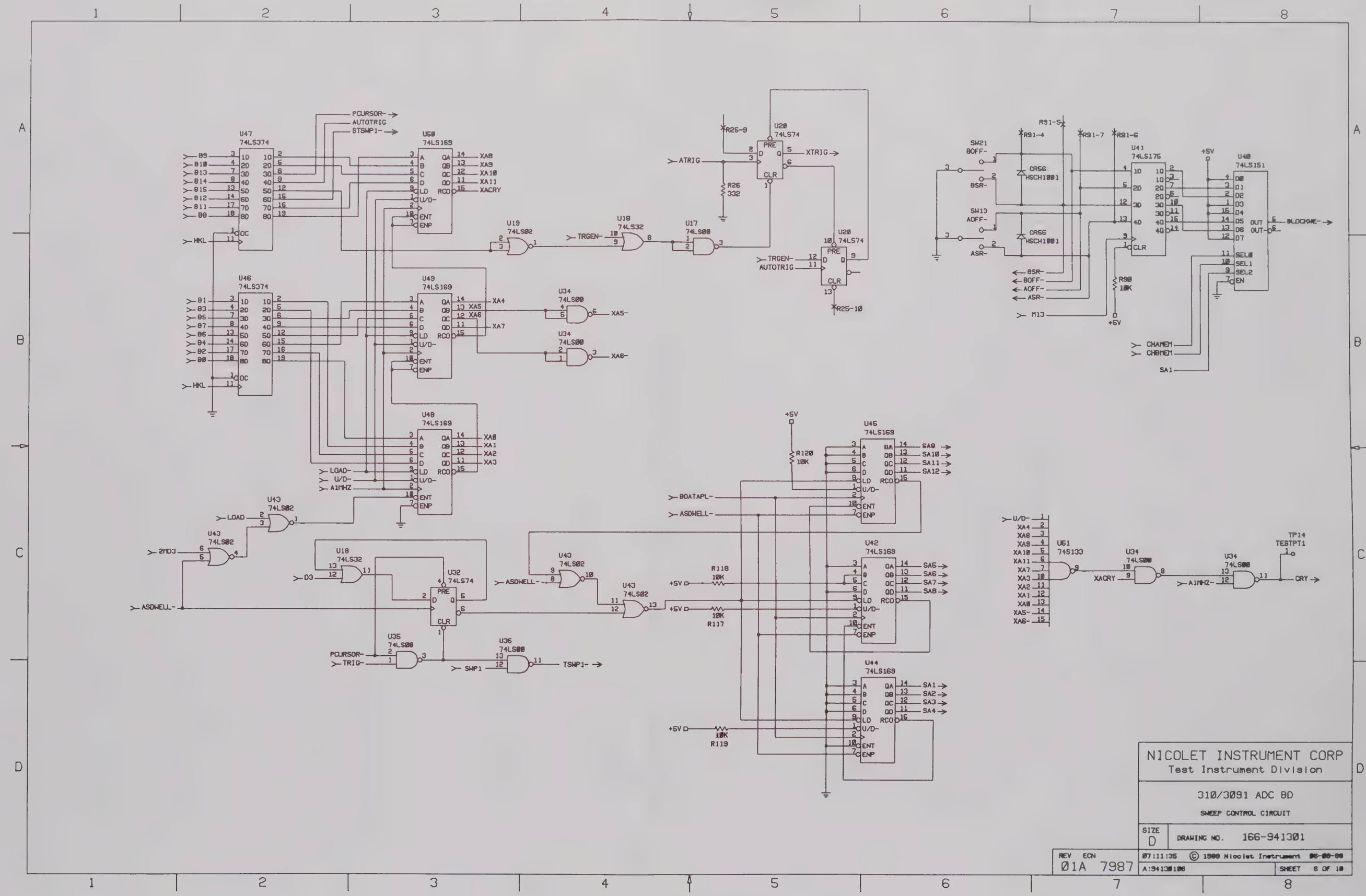
A:941301B5 SHEET 5 OF 10



310 ADC Board
166-941301



NICOLET INSTRUMENT CORP Test Instrument Division	
310/3091 ADC BD SWEEP CONTROL CIRCUIT	
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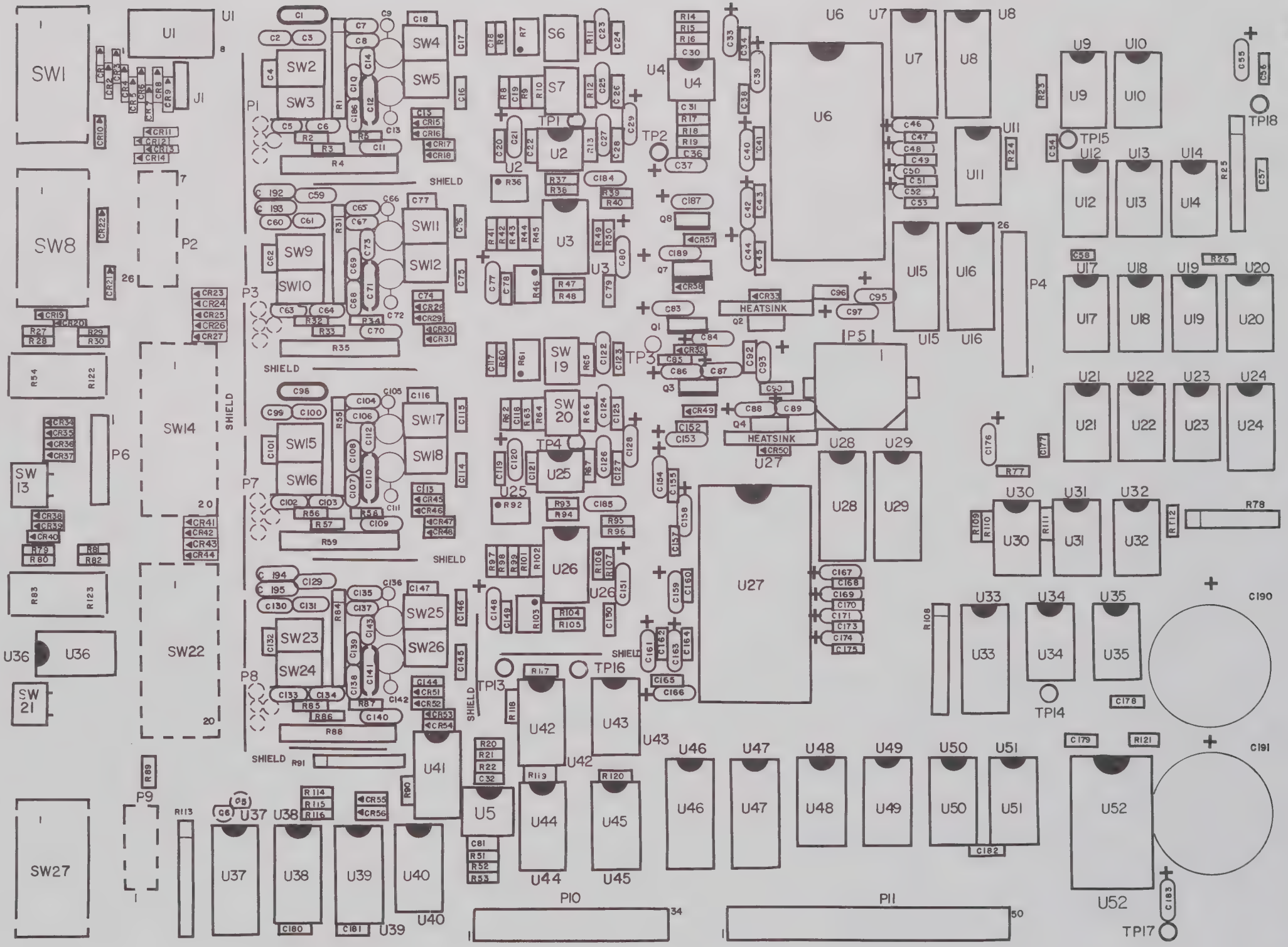
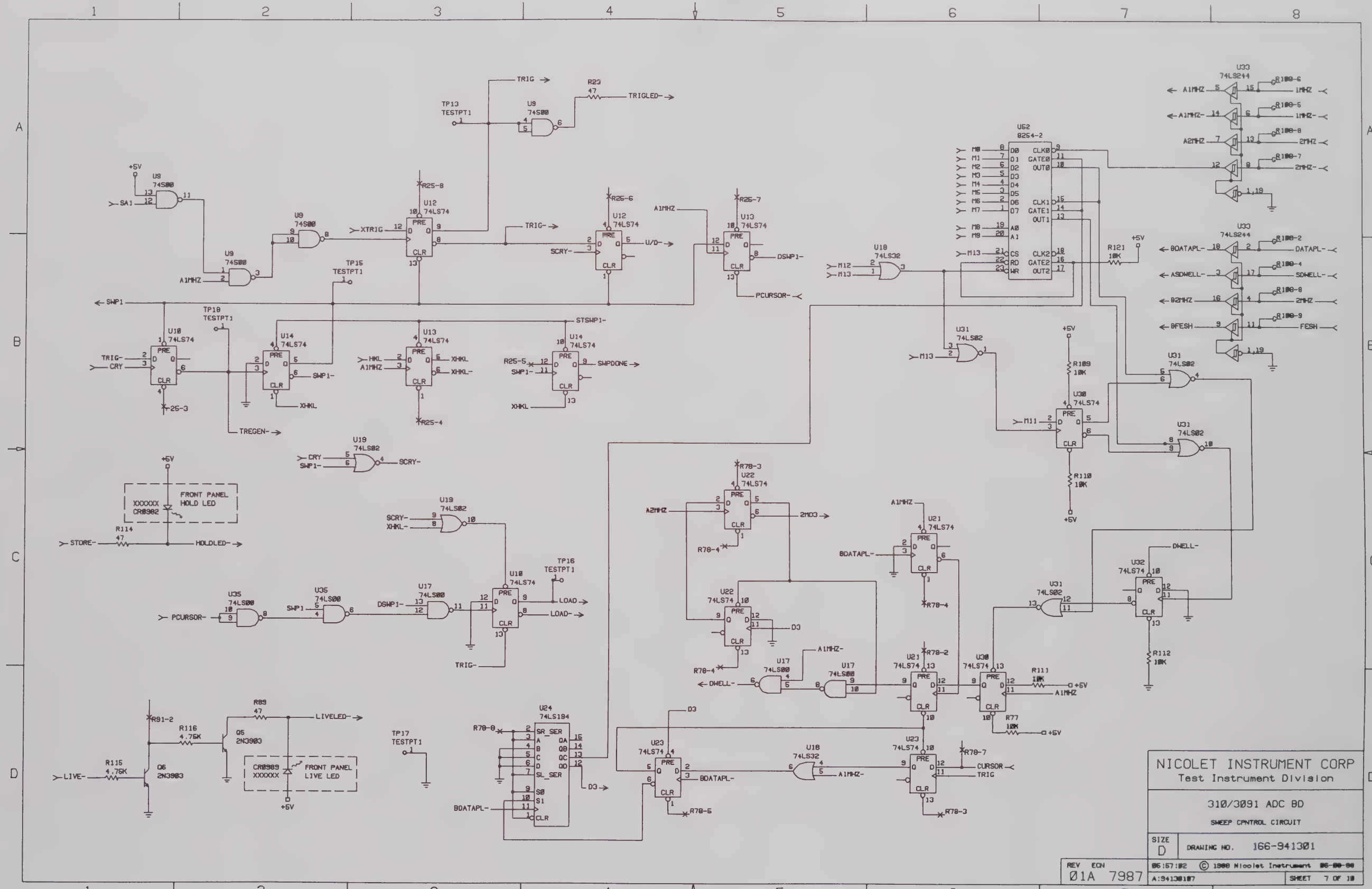
REV ECN Ø1A 7987	Ø7:11:35 © 1988 Nicolet Instrument 00-00-00
A:941301B6	SHEET 6 OF 10



310 ADC Board
166-941301


TRIG
R23
47
TRIGLED-
TP13
TESTPT1
U9
74S00
+5V
SA1
R25-8
U12
74LS74
XTRIG
TRIG-
R25-6
SCRY-
U/D-
A1MHZ
R25-7
U13
74LS74
DSWP1-
PCURSOR-
TP15
TESTPT1
SWP1
TP18
TESTPT1
U10
74LS74
TRIG-
CRY
R25-3
U14
74LS74
SWP1-
XHKL
TREGEN-
STSWP1-
HKL
A1MHZ
XHKL
XHKL-
R25-4
R25-5
SWPDONE
U19
74LS02
CRY
SWP1-
SCRY-
U52
8254-2
M0
M1
M2
M3
M4
M5
M6
M7
M8
M9
M13
D0
D1
D2
D3
D4
D5
D6
D7
A0
A1
CS
RD
WR
CLK0
GATE0
OUT0
CLK1
GATE1
OUT1
CLK2
GATE2
OUT2
U18
74LS32
M12
M13
R121
10K
+5V
U33
74LS244
A1MHZ
A1MHZ-
A2MHZ
R100-6
R100-5
R100-8
R100-7
1MHZ
1MHZ-
2MHZ
2MHZ-
BDATAPL-
ASDWELL-
B2MHZ
BFESH
R100-2
R100-4
R100-8
R100-9
DATAPL-
SDWELL-
2MHZ
FESH
U31
74LS02
U30
74LS74
R109
10K
R110
10K
R111
10K
R112
10K
R77
10K
M11
DWELL-
U32
74LS74
U21
74LS74
U22
74LS74
U23
74LS74
R78-3
R78-4
R78-2
R78-5
R78-7
2MD3
D3
CURSOR
TRIG
U35
74LS00
U17
74LS00
U19
74LS02
TP16
TESTPT1
LOAD
LOAD-
R89
47
LIVELED-
R91-2
R116
4.75K
Q5
2N3903
R115
4.75K
Q6
2N3903
LIVE-
CR8989
XXXXXX
FRONT PANEL
LIVE LED
TP17
TESTPT1
U24
74LS194
R78-8
SR_SER
SL_SER
S0
S1
BDATAPL-
D3
R114
47
STORE-
HOLDLED-
XXXXXX
CR8982
FRONT PANEL
HOLD LED
NICOLET INSTRUMENT CORP
Test Instrument Division
310/3091 ADC BD
SWEEP CONTROL CIRCUIT
SIZE
D
DRAWING NO. 166-941301
REV ECN
01A 7987
05:57:02
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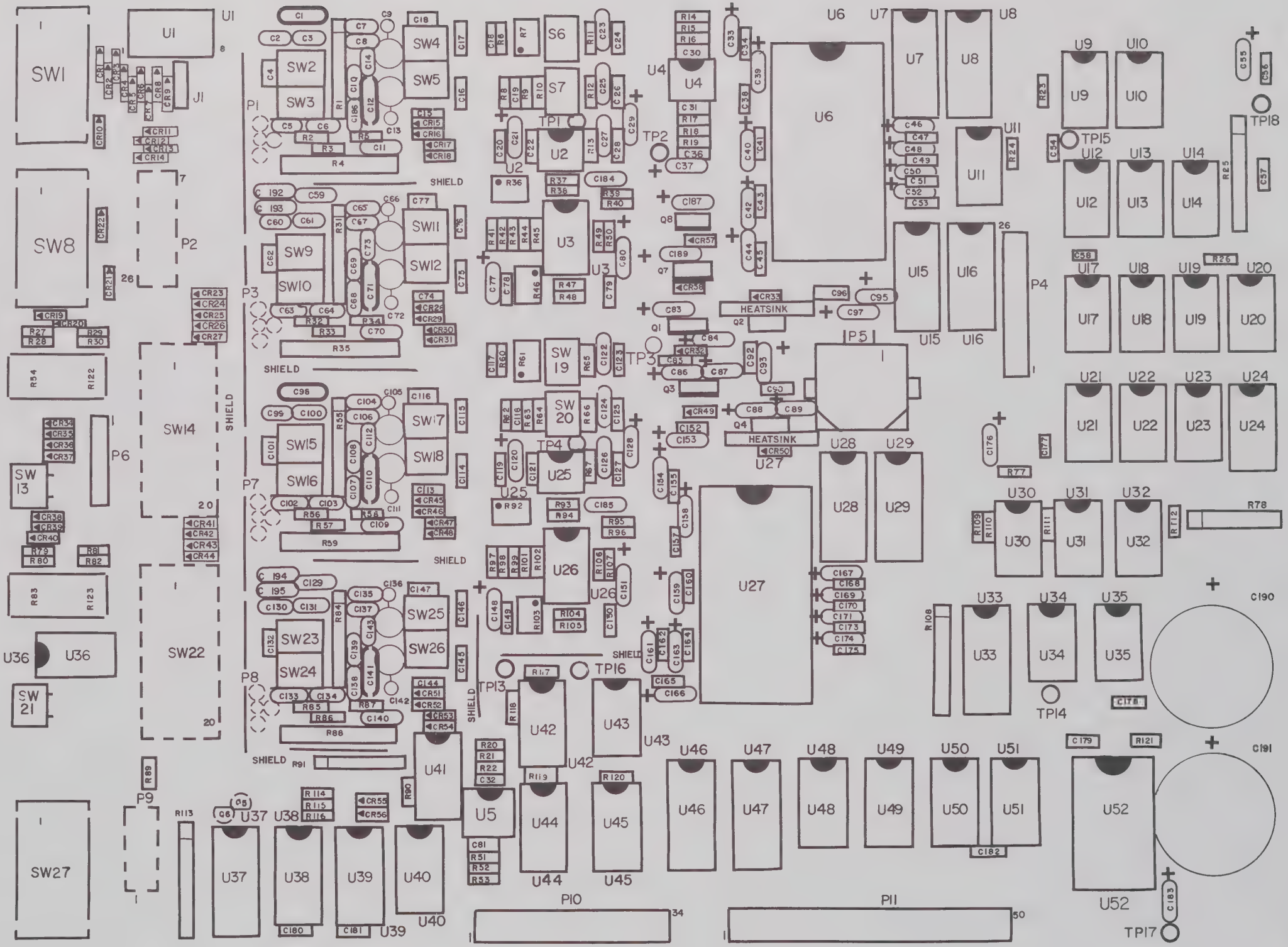
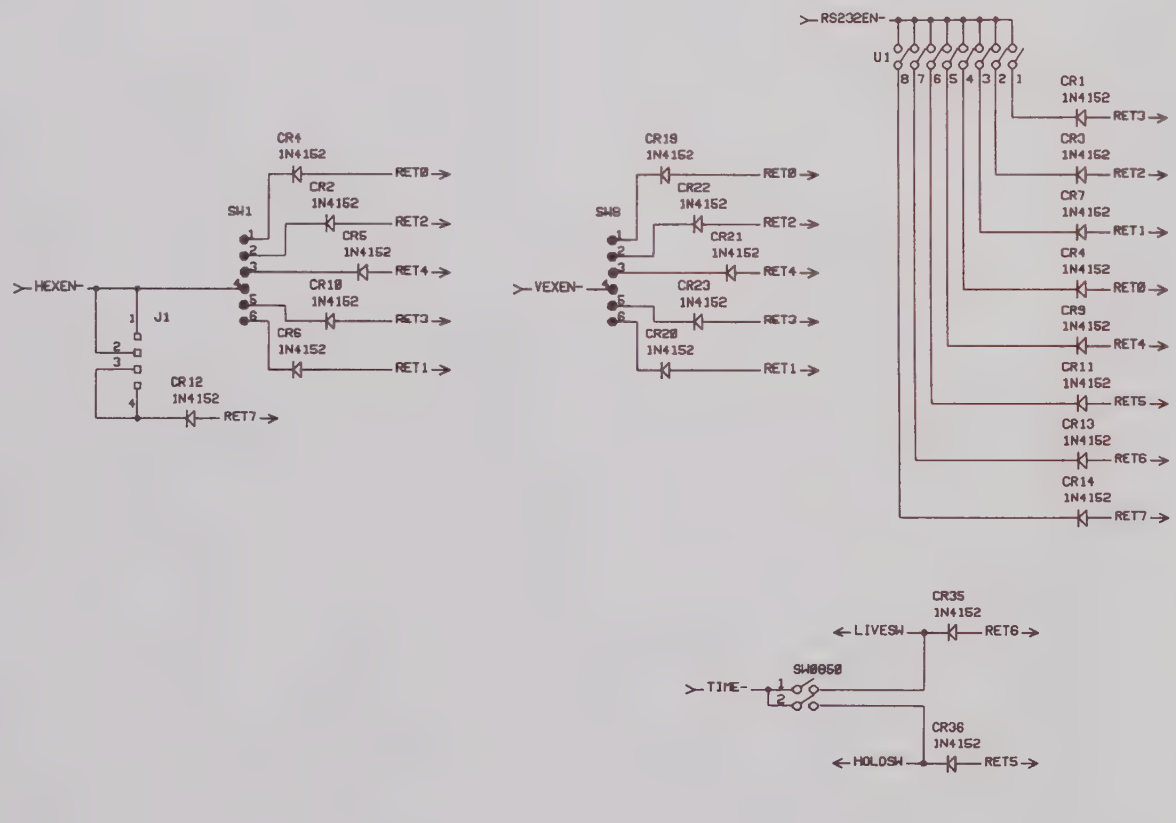
A:9413010?
SHEET 7 OF 10



310 ADC Board
166-941301



NICOLET INSTRUMENT CORP Test Instrument Division		
310/3091 ADC BOARD FRONT PANEL CIRCUIT		
SIZE D	DRAWING NO. 166-941301	
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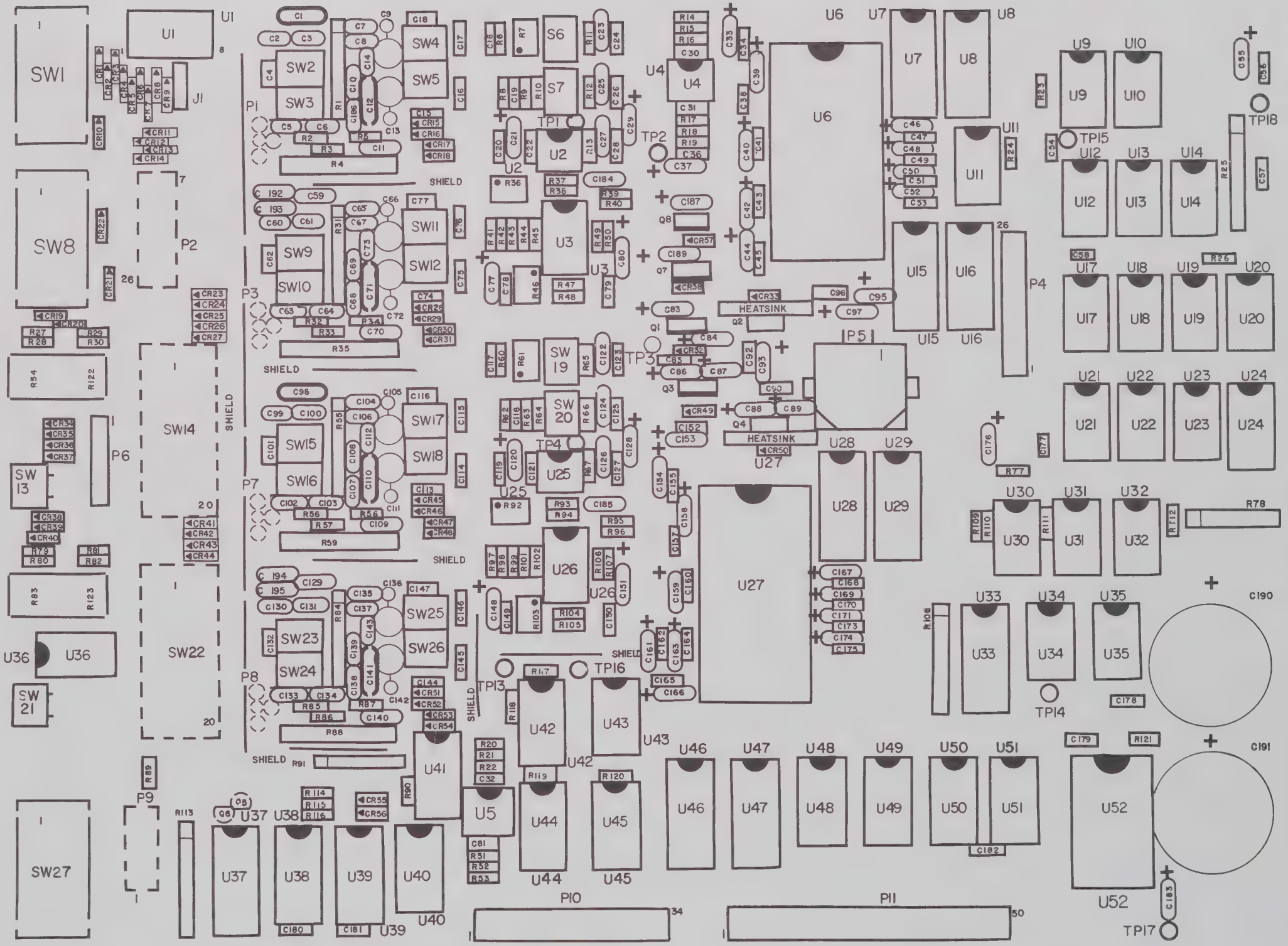
	A:941301ØØ	SHEET 8 OF 1Ø



310 ADC Board
166-941301

NICOLET INSTRUMENT CORP
Test Instrument Division

310/3091 ADC BOARD

REGULATORS AND BUFFERS

SIZE D | DRAWING NO. 166-941301

REV ECN 01A 7987

97:15:12 © 1987 Nicolet Instrument 86-09-09

A:941301B SHEET 9 OF 10

+5V .047 50V C64
+5V .047 50V C65
+5V .047 50V C66
+5V .047 50V C67
+5V .047 50V C58
+5V .047 50V C177
+5V .047 50V C178
+5V .047 50V C179
+5V .047 50V C180

+5V 1uf 35V C55
+5V 1uf 35V C176
+5V 1uf 35V C183

+15V 6800uf 25V C191
-15V 6800uf 25V C190

SW14/SW22
6 7 8 9 10 11 16 17 18 19 20

+12VRB
C89 1uf 35V
C88 .047 50V
C90 1uf 35V
U4 TL780-12 (+12V)
HT018 HEATSINK
CR50 1N4004

+12VRA
C93 1uf 35V
C92 .047 50V
C91 1uf 35V
U2 TL780-12 (+12V)
HT017 HEATSINK
CR33 1N4004

+12VB
C82 1uF 35V
C87 1UF 35V
C86 .047 50V
C85 1UF 35V
U3 MC79L12CT (-12V)
CR49 1N4004

-12VA
C189 1uf 35V
U7 MC79L12CT (-12V)
CR58 1N4004
-15V

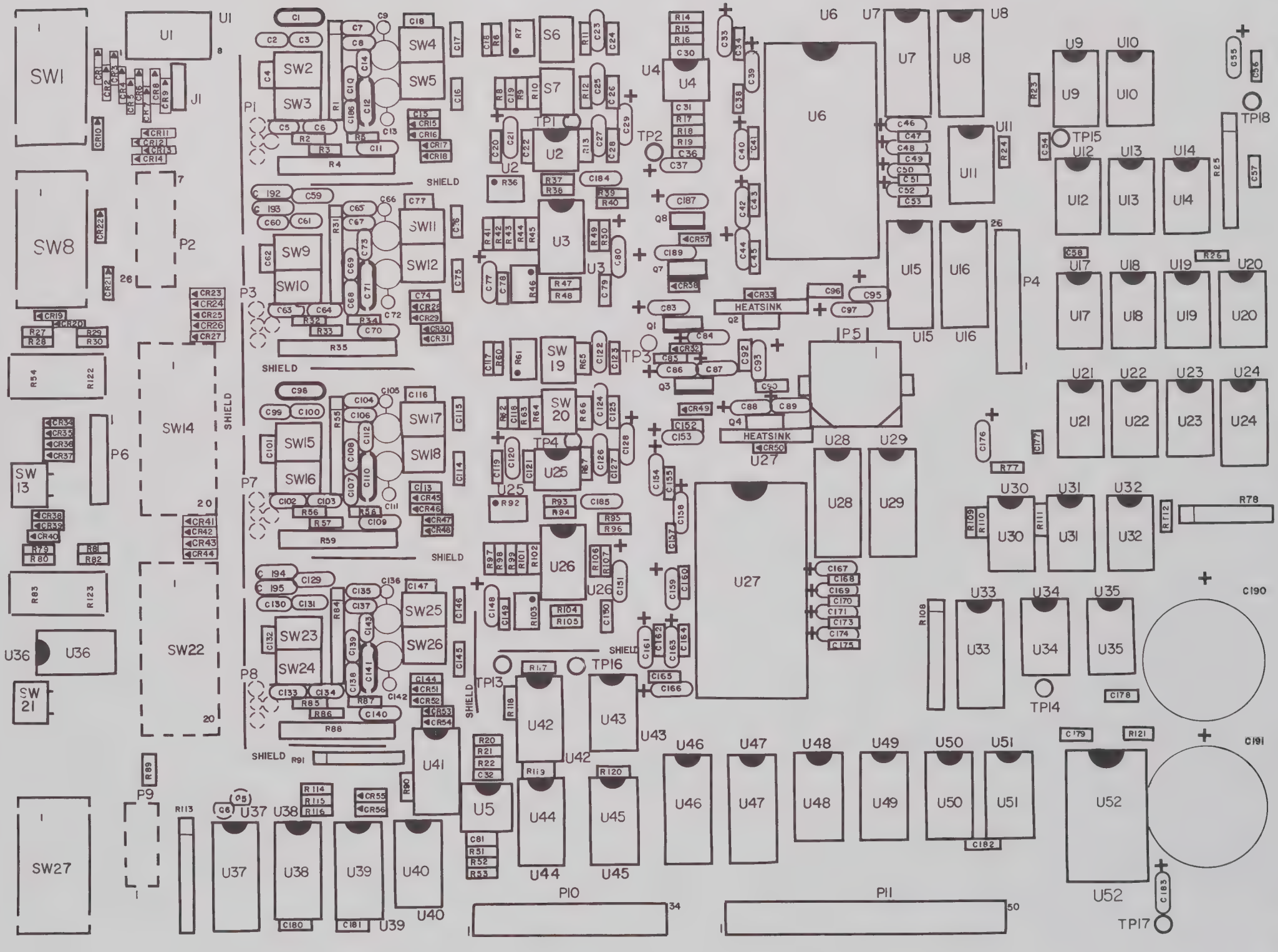
+12VB
C83 1uf 35V
C84 1uf 35V
U1 TL780-12 (+12V)
CR32 1N4004

+12VA
C187 1uf 35V
U8 TL780-12 (+12V)
CR57 1N4004
+15V

512 x 8
U37 M8124H
CS A8 A7 A6 A5 A4 A3 A2 A1 A0 O1 O2 O3 O4 O5 O6 O7 O8
SW14 CHA VOLTS
SW22 CHB VOLTS
R113 4.7K

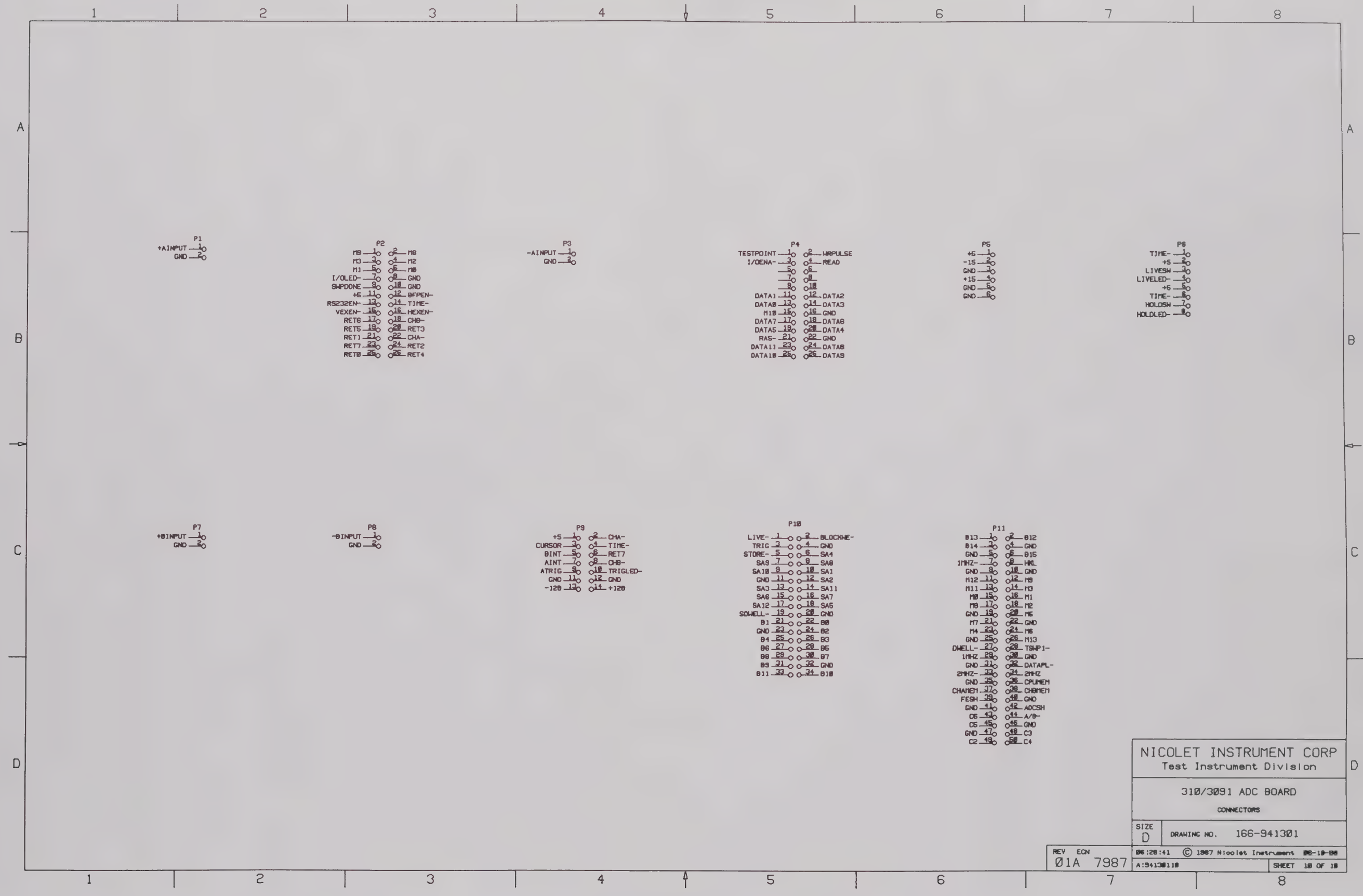
+12VRA
C188 .047 50V
U38 ULN2803 (PWR, GND)
-15VA +15VA +1.5VA -1.5VA A DIVIDE 4 A DIVIDE 2 A DIVIDE 1

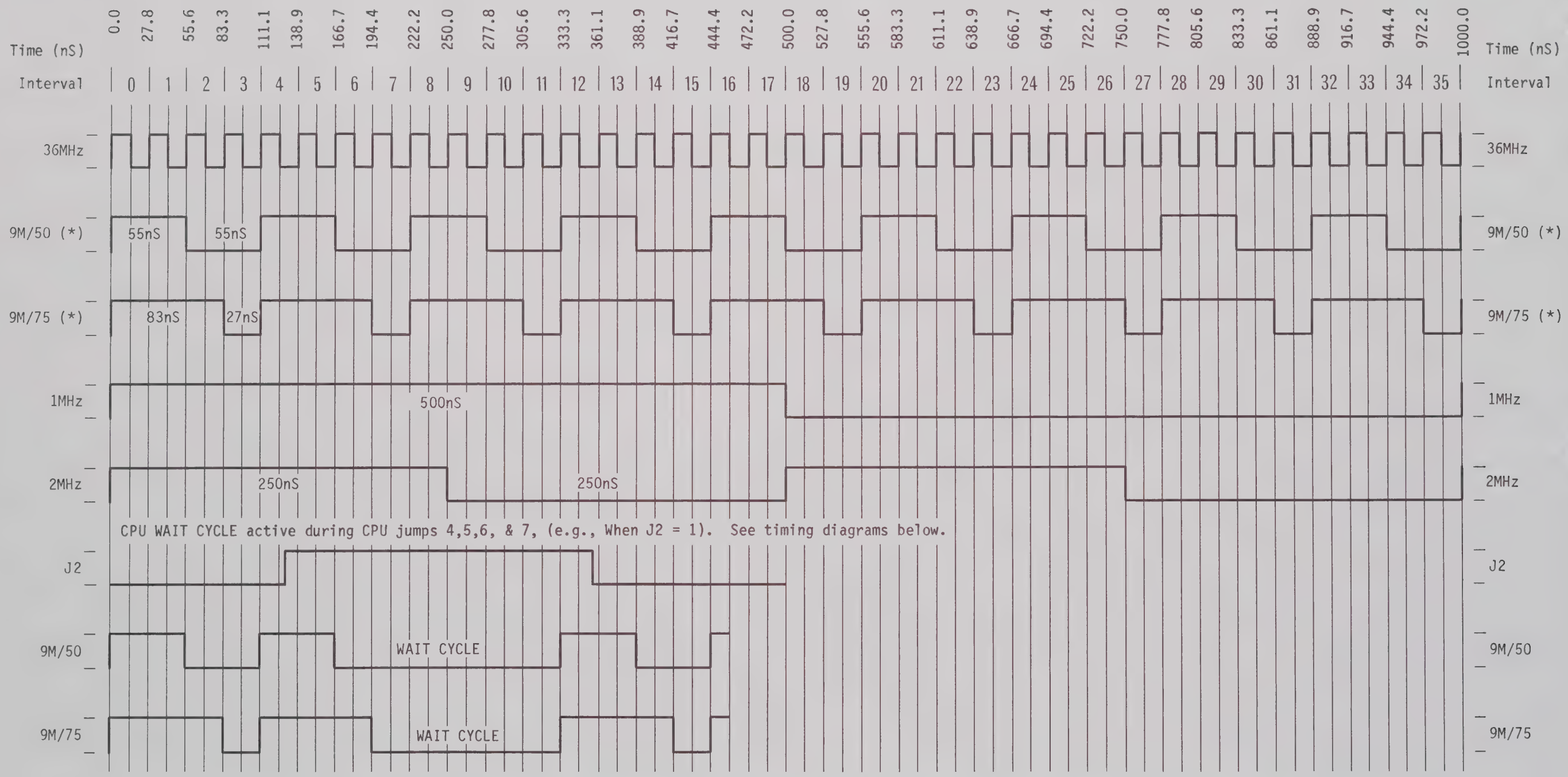
+12VRB
C181 .047 50V
U39 ULN2803 (PWR, GND)
-15VB +15VB +1.5VB -1.5VB B DIVIDE 4 B DIVIDE 2 B DIVIDE 1



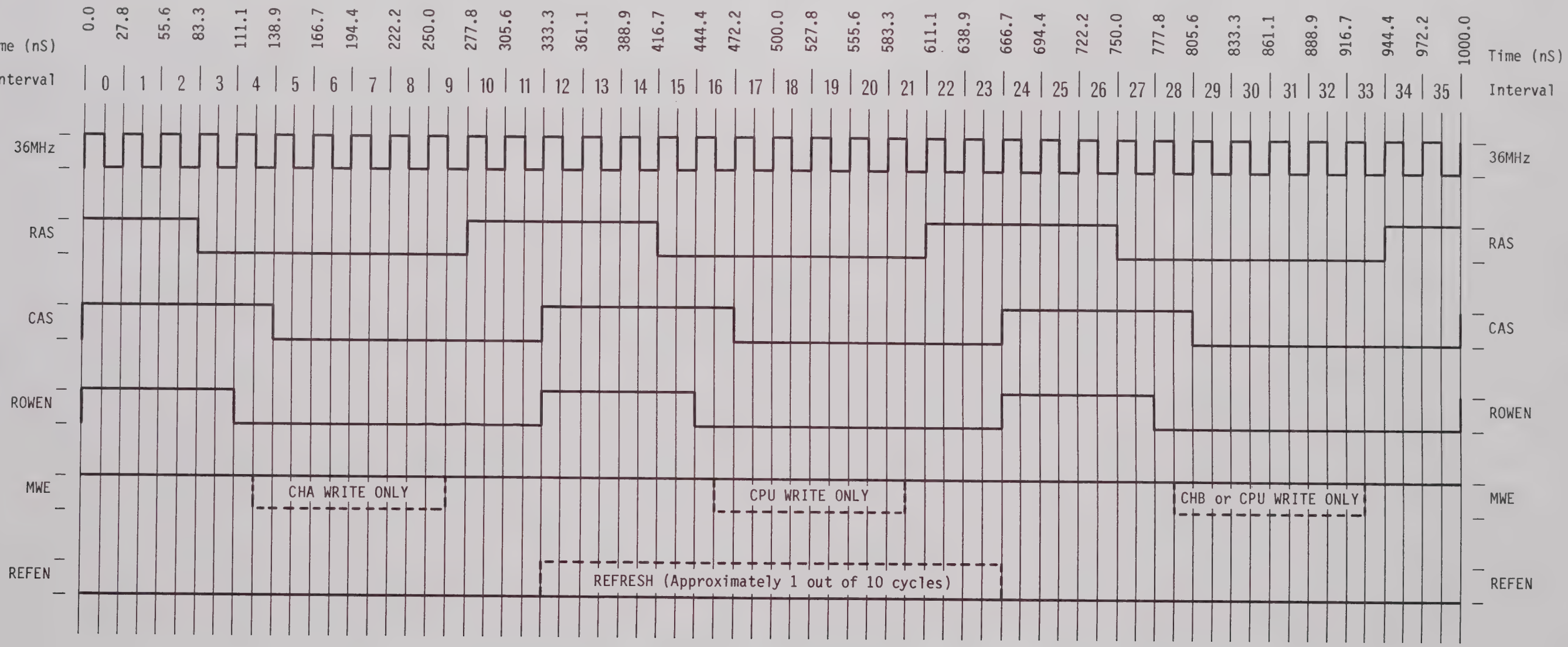
310 ADC Board
166-941301

12-60

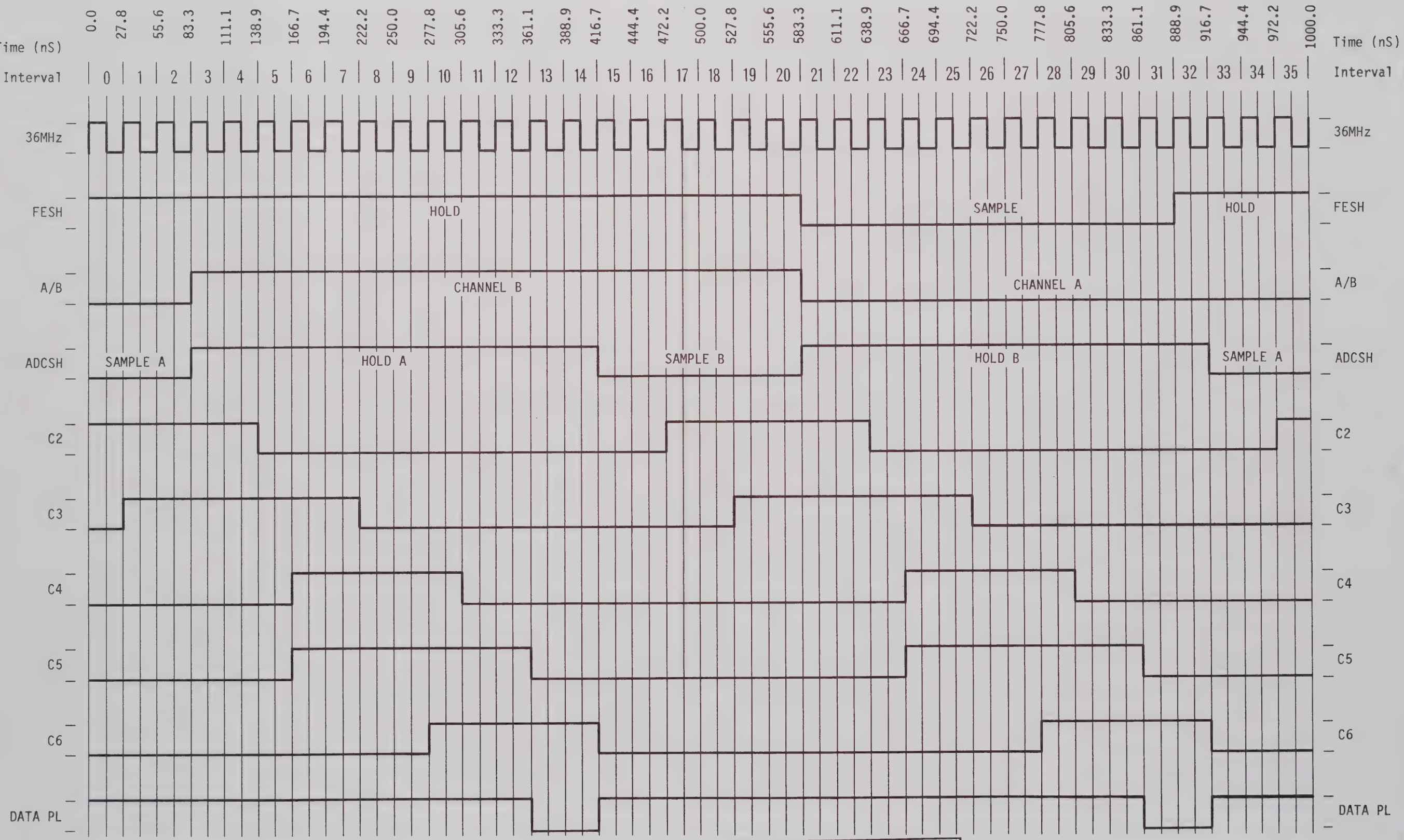

P1
+AINPUT 1
GND 2
P2
M8 1 2 M8
M3 3 4 M2
M1 5 6 M0
I/OLED- 7 8 GND
SWPDONE 9 10 GND
+5 11 12 BFPEN-
RS232EN- 13 14 TIME-
VEXEN- 15 16 HEXEN-
RET6 17 18 CH0-
RET5 19 20 RET3
RET1 21 22 CHA-
RET7 23 24 RET2
RET0 25 26 RET4
P3
-AINPUT 1
GND 2
P4
TESTPOINT 1 2 WRPULSE
I/OENA- 3 4 READ
5 6
7 8
9 10
DATA1 11 12 DATA2
DATA0 13 14 DATA3
M10 15 16 GND
DATA7 17 18 DATA6
DATA5 19 20 DATA4
RAS- 21 22 GND
DATA11 23 24 DATA8
DATA10 25 26 DATA9
P5
+5 1
-15 2
GND 3
+15 4
GND 5
GND 6
P6
TIME- 1
+5 2
LIVESW 3
LIVELED- 4
+5 5
TIME- 6
HOLDSW 7
HOLDLED- 8
P7
+BINPUT 1
GND 2
P8
-BINPUT 1
GND 2
P9
+5 1 2 CHA-
CURSOR 3 4 TIME-
BINT 5 6 RET7
AINT 7 8 CH8-
ATRIG 9 10 TRIGLED-
GND 11 12 GND
-12B 13 14 +12B
P10
LIVE- 1 2 BLOCKME-
TRIG 3 4 GND
STORE- 5 6 SA4
SA9 7 8 SA8
SA10 9 10 SA1
GND 11 12 SA2
SA3 13 14 SA11
SA6 15 16 SA7
SA12 17 18 SA5
SDWELL- 19 20 GND
B1 21 22 B0
GND 23 24 B2
B4 25 26 B3
B6 27 28 B5
B8 29 30 B7
B9 31 32 GND
B11 33 34 B10
P11
B13 1 2 B12
B14 3 4 GND
GND 5 6 B15
1MHZ- 7 8 HWL
GND 9 10 GND
M12 11 12 M9
M11 13 14 M3
M0 15 16 M1
M9 17 18 M2
GND 19 20 M5
M7 21 22 GND
M4 23 24 M6
GND 25 26 M13
DWELL- 27 28 TSMP1-
1MHZ 29 30 GND
GND 31 32 DATAPL-
2MHZ- 33 34 2MHZ
GND 35 36 CPUMEM
CHAMEM 37 38 CHBMEM
FESH 39 40 GND
GND 41 42 ADCSH
C6 43 44 A/B-
C5 45 46 GND
GND 47 48 C3
C2 49 50 C4
NICOLET INSTRUMENT CORP
Test Instrument Division
310/3091 ADC BOARD
CONNECTORS
SIZE D
DRAWING NO. 166-941301
REV ECN
01A 7987
08:28:41 © 1987 Nicolet Instrument 05-19-88
A:941301.10
SHEET 10 OF 10



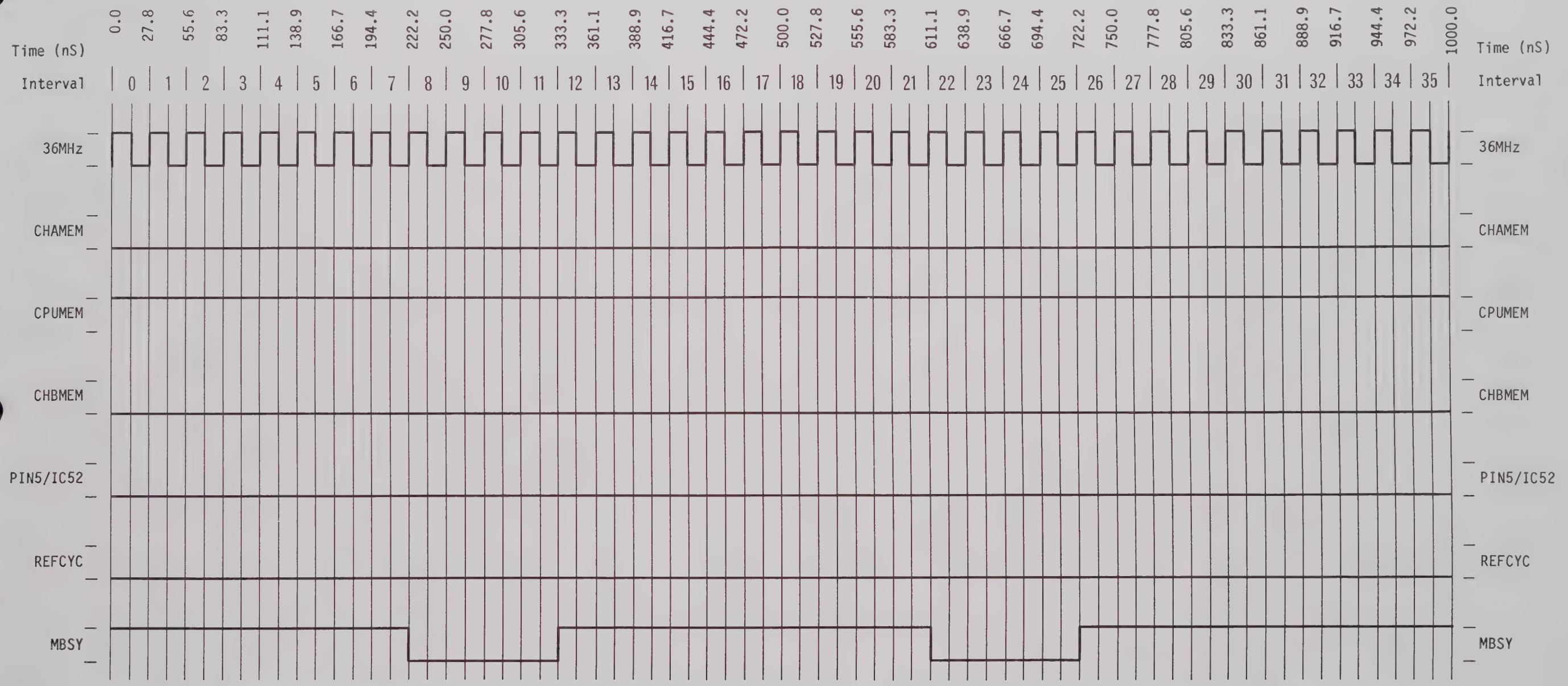
NICOLET INSTRUMENT CORP
310 BASIC TIMING
Timing Chart #1



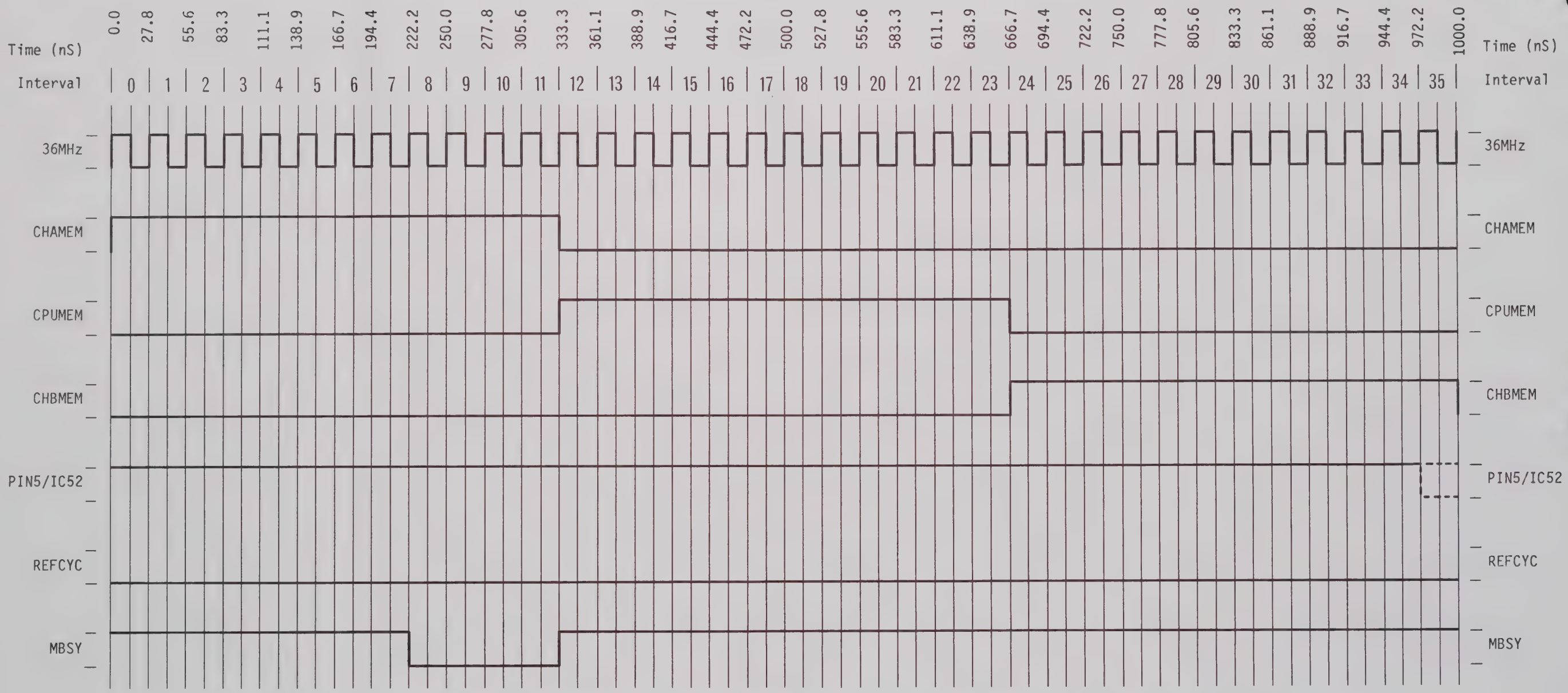
NICOLET INSTRUMENT CORP
310 MEMORY TIMING
Timing Chart #2



NICOLET INSTRUMENT CORP
310 ADC TIMING
Timing Chart #3

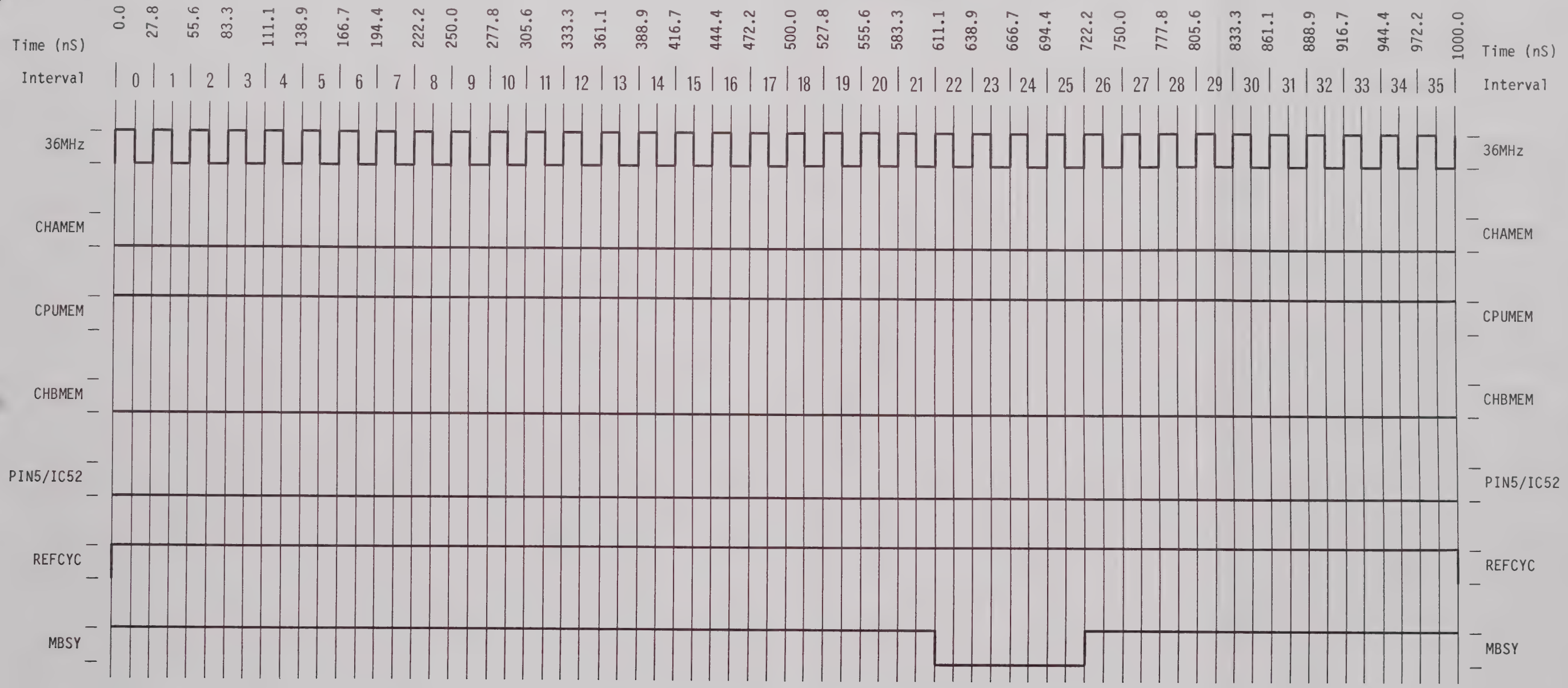


NICOLET INSTRUMENT CORP
310 NORMAL CYCLE (No Dwell, No Refresh)
Timing Chart #4



NICOLET INSTRUMENT CORP
310 DWELL CYCLE (No Refresh)
Timing Chart #5

NOTE: A DWELL and REFRESH cycle can happen simultaneously, (MBSY will stay high).



NOTE: A DWELL and REFRESH cycle can happen simultaneously, (MBSY will stay high).

NICOLET INSTRUMENT CORP
310 REFRESH CYCLE (No Dwell)
Timing Chart #6

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Nicolet Model 310
Digital Oscilloscope
Specifications

Printed 02-21-90

MEMORY SIZE:	4000 points/channel
STORAGE CAPACITY:	Two 4000, or four 2000 waveforms
DISPLAY:	5-inch, high definition
EXPANSION:	Up to X60, both axes, cursor-interactive
MATH FUNCTIONS:	Subtract, Data Move
DISPLAY MODES:	YT, XY, or ROLL
OUTPUTS	
a. Pen Recorder:	XY or YT, 0-5V nominal.
b. Digital:	RS-232C, up to 19,200 baud.
5.25 inch DISK DRIVE (Optional)	
a. Type:	Double sided, Single density
b. Capacity:	360K bytes, 43 waveforms
c. Read/Write Time:	2 seconds
d. Write Protect:	Cover notch in diskette
e. Dimension:	13.3 cm (W) x 2 mm (H) x 13.3 cm (D)
f. Weight (With sleeve):	Less than 1 ounce
3.5 inch DISK DRIVE (Optional)	
a. Type:	Double sided, Double-density
b. Capacity:	720K bytes, 88 waveforms
c. Read/Write Time:	2 seconds
d. Write Protect:	Move sliding tab
e. Dimension:	9 cm (W) x 3 mm (H) x 9.4 cm (D)
f. Weight:	Less than 1 ounce
MISCELLANEOUS	
a. Line Voltage:	115 or 220 VAC, +14% to -20%, 1 ph., 47 - 450 Hz
b. Power:	75 watts (approximate)
c. Weight:	21 pounds (approximate)
d. Dimensions	
1. Base:	37 cm (W) x 13 cm (H) x 43 cm (D) (approximate)
2. Base With Penthouse:	37 cm (W) x 18 cm (H) x 43 cm (D) (approximate)
INPUTS:	Two Differential
a. Coupling:	AC/DC/GND
b. Ranges (Full Scale):	±100 mV to ±40V
c. Impedance:	1 Megohm, 50 pF

Test Instruments Division

Nicolet

5225 Verona Road/P.O. Box 4451 • Madison, Wisconsin 53711-0451 • 608/273-5008 • 800/356-3090

TWX: 910-286-2737 NICOLET MDS C • FAX: 608/273-5061

- 25°C (Within which specifications hold)

°C to +85°C

bits

1%

:egaSamples per second (1 µs per poi
See per point

00 points/channel, 12-bits

000 points/channel, 12-bits

<0% Full Scale

±0.2%

±0.08% Full Scale

100 kHz

5 µs

±5 V

±50 V

±100 V

65 dB

5 dB

0 dB

40 dB

LANE

0V

2% Full Scale

LANE

Full Scale

2%

% of Sweep Time

s

35% Full Scale

0 V (DC and P- AC up to 1 kI +)

Model 310 cont.

WARM-UP TIME:	One hour
SPEC'S. TEMP. RANGE:	18°C - 28°C (Within which specifications hold)
OPERATING TEMP. RANGE:	-10°C to 45°C
VERTICAL RESOLUTION:	12-bits
TIME BASE ACCURACY:	0.01%
DIGITIZING RATE	
a. Maximum:	1 MegaSamples per second (1 µs per point)
b. Minimum:	200 Sec per point
SWEEP LENGTH (max):	4000 points/channel, 12-bits
DATA MEMORY SIZE:	4000 points/channel, 12-bits
DC OFFSET RANGE:	100% Full Scale
DC GAIN EROR:	±0.2%
INTEGRAL NON-LINEARITY:	±0.08% Full Scale
BANDWIDTH (All ranges):	400 kHz
RISE TIME (All ranges):	1.5 µs
COMMON MODE VOLTAGE RANGE	
a. ±100 mV to ±400 mV:	±5 V
b. ±1 V to ±4 V:	±50 V
c. ±10 V to ±40 V:	±100 V
COMMON MODE REJECTION	
a. 100 Hz:	-65 dB
b. 1 kHz	-65 dB
c. 10 kHz	-50 dB
d. 100 kHz	-40 dB
TRIGGER RANGE	
a. External:	±10V
b. Internal:	80% Full Scale
TRIGGER SENSITIVITY	
a. External:	1V
b. Internal:	5% Full Scale
PRE-TRIGGER (max):	100% of Sweep Time
TRIGGER UNCERTAINTY:	1 µs
RMS NOISE (open inputs):	0.035% Full Scale
SAFE OVERLOAD:	360 V (DC and Peak AC up to 1 kHz)